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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities in the USSR, in the Sino-Soviet Orbit countries, and in Yugoslavia, and is disseminated as an aid to the United States Government research.

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I. BIOLOGY

1. Idealism in Biology

"Against Idealistic Concepts in Biology," by Prof K. Kostyukova; Moscow, Meditsinskiy Rabotnik, No 49 (1797), 19 Jun 59, p 2

The author of this article states that the principle of partyism in science always enters any discussion of the processes concerned with the natural development of living objects. Sharp conflict, therefore, began to arise between materialism and idealism and between dialectics and metaphysics from the very moment that biology gained the status of a science.

Scientists of many countries have been carrying on investigations and discussions on the subject of heredity for a long time. Discussions became heated about 30 years ago, bringing about a division of biologists into two irreconcilable camps. Members of one camp defended the autogenetic theory of inheritance; members of the other camp were those who advocated the teachings of I. V. Michurin.

The proponents of the autogenetic theory have voiced the opinion that criticism of their theory is no longer valid because the criticism concerns a hypothesis which their theory has already completely rejected. They claim that the concept of the great stability of the gene, which lies at the basis of Morgan's theory of genetics, has been proven to be not in accordance with the new experimental data. The concept of chance mutation is also on the verge of being rejected by representatives of the autogenetic theory. Results of a number of investigations conducted by the proponents of the genetic theory showed that the lack of a trend in mutations is not substantiated by facts, and also showed that mutations may be obtained by changing the characteristics of the acting forces.

All of this, of course, is not new. What causes some perplexity is that the new facts recently taken into consideration are very significant. One fact is that living organisms can be molded: living organisms respond to environmental forces and undergo adequate changes. This became a powerful weapon long ago in the hands of proponents of the Michurin theory. Utilizing new discoveries, as a result of studies of nucleic acids and mutation of microorganisms, advocates of Morgan's theory are modifying their stand about the gene as the carrier of heredity. Desoxyribonucleic acid is recognized as being such a carrier.

Differences of opinion exist among the proponents of the gene theory. They are united on one thing: to counteract the teachings of I. V. Michurin. Their opposition to the Michurin theory is clearly directed against materialistic biology, which deals with the inheritance of acquired characteristics. Morgan's theory resolutely rejected the possibility of such inheritance. This is understandable because Morganism failed to see the importance of outside forces in the development of living organisms. Individual representatives of a "new" theory of genetics do attribute significance to the effects of outside forces; their position did not change, however, on the question of the inheritance of acquired characteristics.

Lately, in connection with great strides made in physics, the proponents of the genetic theory began to use terms which have been used in cybernetics. For example, statements are made about "circulation of information," i.e., the transmission of inherited characteristics in a number of successive generations.

Biologists must not, in the course of their study of biological phenomena, borrow the terms used in cybernetics, but must utilize all known methods, including those used by physicists, chemists, and mathematicians.

Michurin's teachings confirm the fact that organisms change in accordance with the changing conditions under which they develop. Sex cells, which are the product of the development of organisms, are also subjected to changes. Generations that follow as result of fertilization, therefore, can never be identical to preceding generations. If the development and, consequently, the inheritance of acquired characteristics in electronic computing machines is impossible, then not only is it possible for living bodies, but also, it is necessary.

The theoretical helplessness of proponents of the genetic theory lies in the question of inheritance of acquired characteristics. Genetic theory always regarded division of cells, reduction division, and mitosis as its most important proof. Considerable data now destroy the theoretical foundation of the "new" genetic theory that recognizes desoxyribonucleic acid as the sole carrier of heredity. It is no accident that some sober voices among the proponents of the genetic theory have been appealing against making hasty, farfetched generalizations.

Thus, the genetic theory is again in a state of crisis. This is understandable. During its entire history, only its form has changed: its content has remained the same. This prevents the proponents of the genetic theory from perceiving reality in an objective manner. This leads continuously to a conflict between dialectic manifestations and metaphysical concepts. The inclination, as yet, is to preserve the term "gene", albeit with reservations. But soon the "gene" concept will be discarded as unnecessary for scientific explanations.

In conclusion, the author of this article states that the 21st Congress of the CPSU indicated the path on which further medical research by Soviet medical scientists must stay. Alien ideology is to be rejected. Armed with dialectical materialism, Soviet medicine is proceeding forward along the path indicated by the CPSU.

2. Prof N. A. Dimo, Soviet Soil Scientist, Dies

"Nikolay Aleksandrovich Dimo," (unsigned article); Moscow, Pochvovedeniye, No 6, Jun 59, pp 108-110

Prof Nikolay Aleksandrovich Dimo, Active Member of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin; Doctor of Geologico-Mineralogical Sciences; Director of the Soil Sciences Institute, Moldavian Affiliate of Academy of Sciences USSR; Head, Chair of Soil Sciences, Kishinev State University; and an outstanding Soviet agronomist and soil scientist, died on 15 March 1959 in his 85th year.

Dimo, during the course of his 60 years of scientific and pedagogical work, published over 200 scientific works on the biology of soils, soil conditions in Moldavia, geography of soil types, etc. He was also instrumental in the founding of the Central Asian and Kishinev universities and was active in scientific societies and political affairs of Moldavia.

II. CHEMISTRY

Analytical Chemistry

3. A Method for Determination of Rhenium

"Detection and Determination of Rhenium," by A. I. Lazarev, Akmolinsk Agricultural Institute; Moscow, Zhurnal Analiticheskoy Khimii, Vol 14, No 3, May/Jun 59, pp 362-364

Procedures have been developed for the application of a new reaction for rhenium. This reaction is based on the fact that potassium perrhenate forms a colored compound in the presence of hydrochloric acid, bivalent tin, and sulfite. Conditions for the qualitative and quantitative determination of rhenium by this reaction were established. It has been shown that rhenium is tetravalent in the rhenium-sulfite complex that is formed and that the colored moiety is an anion.

4. Determination of Rhenium With Methyl Violet

"Investigation of the Reaction For Rhenium With Methyl Violet; Part 2 -- Reactions of Methyl Violet With Elements Accompanying Rhenium," by A. T. Pilipenko and V. A. Obolonchik, Institute of Powder Metallurgy, Cermets, and Special Alloys, Academy of Sciences USSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 25, No 3, May/Jun 59, pp 359-362

It was established in Part 1 of this investigation that the product of the reaction of the perrhenate ion with methyl violet can be extracted with toluene. The reaction has been recommended for the colorimetric determination of rhenium. The reactions of methyl violet with ions of elements accompanying rhenium and also with some anions were studied. It was found that in the presence of complex-forming agents the reaction for rhenium is highly specific. Methyl violet can also be used for the colorimetric determination of tantalum in the presence of large quantities of niobium and for the colorimetric determination of osmium in the presence of other platinum metals.

5. A Method for the Determination of Rhenium in Molybdenites

"Determination of Rhenium in Molybdenites by a Colorimetric Method," by N. S. Poluektov and L. I. Kononenko, Laboratory of Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zavodskaya Laboratoriya, Vol 25, No 5, May 59, pp 948-950

A method is described for the determination of rhenium in molybdenites which is based on the application of a catalytic reaction with stannous chloride and sodium tellurate. Ordinarily stannous chloride does not reduce sodium tellurate in acidic solutions; however, in the presence of perrhenates, which act as catalysts, this reaction takes place with the separation of elemental tellurium. The latter is determined colorimetrically. By using this method, rhenium present in quantities amounting to tens of thousandths parts of 1% can be determined.

Fuels and Propellants

6. Solid Phases in System Strontium Hydroxide -- Hydrogen Peroxide -- Water

"Investigation of Systems Containing Concentrated Hydrogen Peroxide; Part 18 -- Physicochemical Characteristics of Solid Phases in the System Sr $(OH)_2$ - H_2O_2 - H_2O," by S. Z. Makarov and T. I. Arnol'd, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 5, May 59, pp 774-780

An investigation of the process of dehydration and thermal data obtained with a recording pyrometer made it possible to identify the following compounds: Sr O_2; Sr O_2 . 8 H_2O; Sr O_2 . H_2 O_2 ; and Sr O_2 . 2 H_2O_2. It was established that elimination of active oxygen from perhydrates is an exothermic reaction up to approximately 75°; that elimination of active oxygen from strontium peroxide is endothermic at approximately 450°; and that water of dehydration is eliminated stepwise (in the case of Sr O_2. 8 H_2O at +80° and at +100°).

Dehydration of the hydrates and perhydrates of strontium peroxide that have been investigated results in the formation of anhydrous strontium peroxide. With the exception of the diperhydrate of strontium, all the peroxidic compounds of strontium which have been investigated are stable at room temperature. The diperhydrate of strontium Sr O_2 . $2H_2$ O_2 decomposes at minus 5°. X-ray diffraction analysis and crystal-optical data confirmed the identity of the peroxide compounds of strontium the existence of which had been established in the investigation described.

7. Kinetics of Reaction of Methane With Nitrogen Dioxide

"Kinetic Relations in the Reaction of Methane With Nitrogen Dioxide," by A. B. Gagarina and N. M. Emanuel', Institute of chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 33, No 7, Jul 59, pp 1641-1647

Investigation of chemical systems which contain nitrogen oxides is of great importance for an understanding of the mechanism of the action of these oxides in chain reactions homogenously catalyzed by them. It has been established that addition of small quantities of NO_2 to mixtures of gaseous hydrocarbons with air or with oxygen greatly accelerates the process of oxidation of these hydrocarbons. Furthermore, it was found that addition of NO_2 to the air with which liquid-phase oxidation of hydrocarbons, mixtures of hydrocarbons, and liquefied gaseous hydrocarbons is carried out has a strong stimulating effect on the oxidation (the so-called gas initiation takes place). Relationships pertaining to the interaction of NO_2 with hydrocarbons also have a bearing on processes of the nitration of hydrocarbons.

In the work described at present, a study has been made of the interaction of methane with NO_2 on the basis of the rise in pressure, which reflects a thoroughgoing oxidation process, and also by determining the reduction in the pressure of NO_2. A zero order has been found for the rate of the over-all rise in pressure and a first order with respect to the initial methane pressure. It was established that additions of NO have an accelerating effect on the pressure rise and additions of oxygen a strong inhibiting effect. The effective energy of activation of the process has been calculated and found equal to 42 kcal/mol.

8. Chain-Thermal Propagation of Flame With Two Active Centers Having Different Diffusion Coefficients

"Theory of the Chain-Thermal Propagation of Flame With Two Active Centers Having Different Diffusion Coefficients," by L. A. Lovachev, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 1, 1 Mar 59, pp 129-132

The subject of chain-thermal propagation of flame with two active centers having different diffusion coefficients is subjected to theoretical (mathematical) treatment. Two relationships are derived. The first makes it possible to estimate quantitatively the leading role of one of the two active centers when the two centers have different coefficients of diffusion. The second enables one to calculate the change in the velocity of flame propagation when there are simultaneous changes in the coefficients of diffusion of the active centers and in the heat conductivity of the mixture.

9. Formation of High-Density Layer of Gas in Front of a Detonation Wave Established by X-Ray Method

"Investigation by the X-Ray Method of the Density Distribution in the Detonation Front of Gas Mixtures," by M. A. Rivin (deceased), Academician Ya. B. Zel'dovich, V. A. Tsukerman, V. V. Sof'ina, and A. S. Beregovskiy, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 6, 21 Apr 59, pp 1292-1293

It has been assumed for the past 15 years that matter contained in a detonation wave undergoes shock compression before being subjected to combustion. At any moment in the detonation wave there must be a layer to compressed gas between the unexited gas mixture in its initial state and the products of combustion in a state that conforms to the demands of thermodynamic theory. The thickness of this layer is proportional to the time required for the evolution of heat by the compressed gas being subjected to the chemical reaction. Attempts by G. B. Kistiakowsky and coworkers to establish the presence of the layer of compressed gas by means of an X-ray densimeter did not lead to a clear result becaue of the insufficient resolution obtained by this method under the conditions employed by them (cf Journal of Chemical Physics, Vol 19, 1951, p 1611; Vol 25, 1956, p 824). The authors of the present article carried out X-ray densimeter measurements on the detonation front of a hydrogen-oxygen mixture to which hydrogen iodide had been added. The distinguishing characteristics of the procedure used by them were employment as a source of X-radiation of a pulse needle tube with a zirconium anode and addition of krypton to the gas mixture. The characteristic radiation emitted by zirconium lies within the krypton absorption band. Combined use of the radiation technique mentioned and of an absorbing ingredient (krypton) made it possible to measure density changes in relatively thin gas layers. In the experiments conducted, formation in the front of the detonation wave of a thin layer of gas the density of which is 3-4 times greater than the initial density was established with certainty. In the majority of cases the thickness of this layer was 0.1-0.3, mm, which is close to the limit of resolution attained by the method described.

10. Method for Measuring Coefficient of Thermal Ionization of Gases Behind Shock Wave

"News Item -- USSR" (unsigned item); Moscow, Atomnaya Energiya, Vol 7, No 1, Jul 59, pp 87-88

At the Physical Faculty of Moscow State University a method has been developed for measuring the coefficient of the thermal ionization of a gas in the stream behind a shock wave which propagates in a shock-tube

with a velocity of approximately 3 kilometers per second. The measurements were carried out by means of a volume resonator at a wave-length of 10 centimeters. The stream of ionized gas passes along the axis of a cylindrical high-frequency resonator without any change in its gas-dynamic characteristics. Changing the Q-factor of the resonator and displacement of the resonance frequency while the gas passes through the resonator makes it possible to observe directly the ionization process and to conduct quantitative measurements. The duration of the ionization process being recorded depends on the velocity of the shock wave. It comprised approximately 200 microseconds. The method described makes it possible to determine changes in the coefficient of ionization with a precision of about 10% at several intervals (10-15) of the process being investigated. By applying this method, one can determine the duration of the ionization pulse and the steepness of the leading and trailing fronts.

Industrial Chemistry

11. Treatment of Sea Water For Use at USSR Electric Power Plants

"Creative Collaboration of Workers in Science With Production Workers," by M. G.; Baku, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Neft' i Gaz, No 6, Jun 59, pp 133-134

"With the help of the Azerbaydzhan Order of Labor Red Banner Institute of Petroleum and Chemistry imeni M. Azizbekov at Baku, work on the softening of sea water for technological purposes has been conducted at the 'Severnaya' State Regional Electric Power Station (GRES). This work must be continued. According to Guseynov, director of the State Regional Electric Power Station, electric power stations located at Feodosiya, Krasnovodsk, Magadan, and elsewhere are also interested in it."

12. Desalting of Water by Simultaneous Cation- and Anion-Exchange

"Desalting of Water by the Method of Combined Desionization With Ion-Exchange Resins," by A. B. Pashkov; Moscow, Khimicheskaya Promyshlennost', No 4, Jun 59 (published in July 1959), pp 311-317

A new method of desalting water is by passing it through a mixture of an anion-exchange resin with a cation-exchange resin. If the layer of ion-exchange resions is thick enough, complete desalting of water can be accomplished by a single passage through the ion-exchange resins of the water to be treated. Regeneration of the resins can be carried out in two ways, either by separating the anion-exchange resin from the cation-exchange resin and treating them separately or by treating

appropriately the whole layer without separating the two kinds of ion-exchange resins. Separation is brought about by flotation with a stream of water introduced into the layer from the bottom. As a result of this treatment, the anion-exchange resin, which is the lighter of the two, is separated and settles on top.

The process of "combined desionization" ((simultaneous cation- and anion-exchange) was originally described in 1940. During World War II, a process of this type was applied in England on a large scale for the desalting of sea water to make it suitable for use in marine aviation.

At present combined desionization is applied on a large scale in many countries. Some industrial firms supply ready-made mixtures of ion-exchange resins for that purpose. Two examples are the Amberlite MB 1-C manufactured by the Rohm and Haas Company and the Bio-Diminerablite manufactured by the Permutit Company.

The following combinations of ion-exchange resins can be used for combined desionization:

(1) A strongly acidic cation-exchange resin ((KU)) and a strongly basic anion-exchange resin (AN).

(2) A strongly acidic cation-exchange resin ((KU)) and a weakly basic anion-exchange resin (AN).

(3) A carboxylic cation-exchange resin ((KB)) and a strongly basic anion-exchange resin (AV).

(4) A carboxylic cation-exchange resin ((KB)) and a weakly basic anion-exchange resin (AF).

The following USSR resins can be used for combined desionization: the cation-exchange resins KU-2, KB-4, KB-2, KB-1, and KB-1g; the weakly basic anion-exchange resin AN-2F-G; and the strongly basic anion-exchange resins AV-17, AV-16G, and AV-17.

Water of high purity is obtained by the method described. The average resistance of the water treated by the method of combined desionization amounts to approximately 5 million ohms X centimeters.

Combined desionization is being applied industrially for the following purposes:

(1) Complete desalination of natural waters containing a small quantity of inorganic substances and of the condensate of steam turbines.

(2) Final purification of water which has been subjected to multistage ion-exchange demineralization, including purification of water which has a relatively high content of impurities.

(3) Production of water of high purity from fresh water with an average salt content (up to one gram per liter) in cases when this type of treatment is feasible from the economic standpoint.

Industrial Hygiene

13. New Wetting Agent for Dust-Collecting Investigated

"Investigation of the Dust-Collecting Properties of Wetting-Agent Solutions in a Dust Chamber," by S. Kh. Zakiyeva and A. B. Taubman, Institute of Physical Chemistry of the Academy of Sciences USSR; Zhurnal Prikladnoy Khimii, Vol 32, No 4, Apr 59, pp 797-800

A special method of operating a laboratory dust chamber has been developed which permits an evaluation of the effectiveness of the dust-collecting action produced by solutions of surface-active substances used as wetting agents in the collection of dusts forming a danger from the standpoint of silicosis and anthracosis in connection with mining operations.

Experiments conducted with PAS-Na, a new synthetic wetting agent, showed that it effectively increases the dust-collecting action of water. The new wetting agent was developed at the Petroleum Institute of the Academy of Sciences USSR by A. Ya. Larin.

Inorganic Chemistry

14. Complex Compounds of Rhenium With Pyridine

"Complex Compounds of Pentavalent Rhenium With Pyridine," by V. V. Lebedinskiy (deceased) and B. N. Ivanov-Emin, Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1762-1767

The compounds $[Re\ O_2\ 4\ Py]Cl$, $[ReO(OH)\ 4Py]Cl_2$ and $[ReO_2\ 4Py]_2\ [ReOCl]_5$ were synthesized. Their properties are described. It is noted that the compounds in question are analogous to the ethylenediamine complexes of rhenium which were investigated earlier.

15. Reduction of Ammonium Perrhenate With Hydrogen to Rhenium and Some Aceto-Complex Compounds of Trivalent Rhenium

"The Composition and Thermal Stability of Acetocomplex Compounds of Re ^{III}," by Miao Ch'ing-sheng and V. G. Tronev; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1768-1774

The conditions of the reduction of ammonium perrhenate with hydrogen under pressure at a temperature of 300-400° were studied with the purpose of obtaining pure rhenium. The compound NH_4 $ReCl_4$ was synthesized and found to be analogous in its properties to the salts $RbReCl_4$ and $CsReCl_4$ that were already known. It was established that compounds of the type $MeReCl_4$ undergo disproportionation in concentrated hydrochloric acid solutions at 250° in an atmosphere of nitrogen of hydrogen under pressure, forming Re^{II}, Re^{IV}, and Re^{VII}. An attempt to synthesize compounds of the type Me_3 Re Cl_3 by the iodide method did not succeed, because only compounds with the composition Me_2 $ReCl_6$ were formed. It was established that when compounds of the type $MeReCl_4$ are heated in the dry state in a nitrogen atmosphere, there is decomposition with the formation of Me_2ReCl_6, $ReCl_3$, and metallic rhenium. It was found that the thermal decomposition of NH_4ReCl_4 takes place at 365°, of $RbReCl_4$ at 340°, and of $CsReCl_4$ at 320°. In other words, the decomposition temperature drops as the radius of the cation increases.

16. New Powerful Systemic Insecticide: Dimethyl Ester of Isopropylurethane-N-phosphoric Acid

"Esters of Urethanephosphoric Acids," by A. V. Kirsanov and M. S. Makarets, Institute of Organic Chemistry of the Academy of Sciences Ukrainian SSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2256-2262

The dimethyl ester of methylurethane-N-phosphoric acid (preparation "Kiev-20-35") was obtained directly from the methyl ester of trichlorophosphazocarbonic acid (with a yield of 80%) and from the acid dichloride of methylurethane-N-phosphoric acid (in a 76% yield). A total of six esters of trichlorophosphazocarbonic acid (type formula: $ROCON{=}PCl_3$) were prepared and a method was developed for converting them into acid dichlorides of urethane-N-phosphoric acids by the action of water.

The temperature at which the thermal decomposition of trichlorophosphazocarbonic acid esters into alkyl halides and acid dichlorides of isocyanatophosphoric acid occurs depends on the nature of the alkyl group. With an increase of molecular weight of the alkyl group, the decomposition temperature goes up. The esters containing alkyls with an iso-structure decompose at lower temperatures than their isomers containing alkyls with a normal structure. A number of esters of urethane-N-phosphoric acids were prepared, several of which are active systemic insectides nontoxic to warm-blooded animals.

The most active systemic insecticide from this group is the dimethyl ester of isopropylurethane-N-phosphoric acid, whose activity is several times as great as that of preparation K-20-35, the dimethyl ester of methylurethane-N-phosphoric acid, $CH_3OCONHPO(OCH_3)_2$, according to tests conducted by G. A. Yefimov at the Laboratory of Insecticide Chemistry, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR.

17. New Insecticides: Amidoesters of Thiophosphoric and Dithiophosphoric Acids

"Organophosphorus Insecticides. VI. Amidoesters of Thiophosphoric and Dithiophosphoric Acids Which Contain the beta-Ethylmercaptoethyl Group," by M. I. Kabachnik, N. N. Godovikov, D. M. Paykin, M. P. Shabanova, L. F. Yefimova, and N. M. Gamper, Institute of Organoelemental Compounds, Academy of Sciences USSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2182-2190

The object of the research was to prepare and investigate the insecticidal activity of amidoesters of thiophosphoric and dithiophosphoric acids which contain the beta-ethylmercaptoethyl group. The authors assumed that such compounds would exhibit strong systemic insecticidal activity. None of these compounds had previously been synthesized.

The starting materials used for the synthesis of these compounds were ethyldimethylamidochlorothionophosphate (I), ethyldiethylamidochlorothionophosphate (II), and tetramethyldiamidochlorothionophosphate (III). The first two acid chlorides were obtained by the action of dimethylamine or diethylamine on ethyldichlorothionophosphate. Tetramethyldiamidochlorothiophosphate was synthesized both by the reaction of dimethylamine with thiophosphorylchloride and by heating tetramethyldiamidochlorophosphate with phosphorus pentasulfide.

By the action of beta-hydroxyethylsulfide on the above-mentioned acid chlorides in the presence of sodium hydroxide powder, O-ethyl-O-beta-mercaptoethyldimethylamidothiophosphate (Gd-50), O-ethyl-O-beta-ethylmercaptoethyldiethylamidothiophosphate (Gd-52) and O-beta-ethylmercaptoethyltetramethyldiamidothiophosphate (Gd-64) were synthesized.

After heating for 8-10 hours at 160-170°C, the previously obtained compounds isomerized correspondingly into O-ethyl-S-beta-ethylmercaptoethyldimethylamidothiophosphate (Gd-53), O-ethyl-S-beta-ethylmercaptoethyldiethylamidothiophosphate (Gd-54) and S-beta-ethylmercaptoethyltetramethyldiamidothiophosphate (Gd-66).

Furthermore, by the interaction of ethyldimethylamidochlorothionophosphate and ethyldiethylamidochlorothionophosphate with the sodium derivative of beta-mercatodiethylsulfide the corresponding O-ethyl-S-beta-ethylmercaptoethyldimethylamidodithiophosphate (Gd 55) and O-ethyl-S-beta-ethylmercaptoethyldiethylamidodithiophosphate (Gd 56) were obtained.

The physical constants and yields of the newly obtained insecticides are listed in a table.

Laboratory tests of the compounds synthesized, both for their action as insecticides and acaricides, were conducted on the harmful pentatomidae insects, farinaceous scale insects, and the arachnoid tick.

Several amidoesters of thiophosphoric and dithiophosphoric acids (Gd-53, Gd-54 and Gd-56) were found to be active systemic acaricides against the arachnoid tick and deserve further study. They did not approach thiophos in insecticidal activity.

18. Insecticidal Properties of Antibiotics

"The Use of Antibiotics Against Insects -- Plant Pests," by A. G. Kuchayeva, Institute of Microbiology, Academy of Sciences USSR; Moscow, Vestnik Sel'skokhozyaystvennoy Nauki, Vol IV, No 7, Jul 59, pp 138-140

A report on the results obtained in the use of antibiotics for control of the gypsy moth -- Portheria dispar L. -- whose caterpillars are very harmful to agricultural and forestry plants, is given. Thirty-four antibiotics derived from actinomycetes, bacterial, fungus, and synthetic origins, were tested. Solutions of the antibiotics were applied to the leaves of plants infested with gypsy moth eggs and caterpillars. The experiments established that on the basis of their effectiveness the antibiotics may be divided into four groups: the antibiotics in the first group had no noticeable effect on the development of the caterpillars; the second group comprised antibiotics which had an inhibiting effect on the growth of the caterpillars, without killing them; the third group contained antibiotics which had a stimulating effect on the development of the caterpillars; the fourth contained antibiotics which exhibited specific insecticidal properties when applied to the plants. These included: antibiotic preparation 2703, which killed an average of 35 percent of the caterpillars on the eighth day after its application; actinomycin, which killed 46 percent of the insects; preparations 1205, 119, 194, 819, and 1775, from which 73 percent of the caterpillars perished; and preparation 719, which killed 100 percent of the insects 6 days after its application.

19. Triefiran-4 -- An Agricultural Insecticide

"Agricultural Insecticide 'Triefiran-4,'" by Sh. A. Mamedov and G. Ya. Lerner (Invention No 121121); Moscow, Byulleten' Izobreteniy, No 14, 1959, pp 9-10

Dibutylacetal trichloroacetaldehyde has found use as an agricultural insecticide, which is called "Triefiran-4." It has been used to control insects which attack citrus crops (the Chinese waxy pseudo-scale insect) and those which attack cotton plants (aphids and web mites).

20. Chlorophenoxyacetic Acid Esters as Effective Herbicides

"Research in the Field of Herbicide Synthesis," by V. V. Dovlatyan, Chair of General Chemistry of the Armenian Agricultural Institute; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSSR, Vol 12, No 3, 1959, pp 201-206

The synthesis and properties of previously unknown gamma-chlorocrotyl esters of aryloxy- and halo-acetic acids are described in this report.

Chloro-, trichloro-, and some aryloxyacetic acids are easily esterified by a slight excess of gamma-chlorocrotyl alcohol without the use of catalysts.

The synthesis of the above-mentioned esters (by the action of the sodium salts of the aryloxyacetic acids on 1, 3-dichlorobutene-2) can be performed in the presence of pyridine as a catalyst.

From among the compounds synthesized, high herbicidal activity was exhibited by the gamma-chlorocrotyl esters of 4-chlorophenoxy- and 2-methyl-4-chlorophenoxyacetic acids (against broad-leaved weeds) and trichloroacetic acid (against grasses).

Laboratory and vegetative tests were conducted at the Institute of Soil Cultivation of the Ministry of Agriculture Armenian SSR by G. A. Darbinyan.

21. "Krotilin" -- A New Herbicide

"A New Herbicide -- 'Krotilin,'" by Docent N. Karapetyan, Armenian Agricultural Institute; Moscow, Nauka i Peredovov Opyt v Sel'skom Khozyaystve, No 6, 1959, p 45

V. Dovlatyan, Associate of the Chair of General Chemistry of the Armenian Agricultural Institute, has synthesized a new herbicide which he calls "Krotilin." According to the author, it surpasses 2,4-D and is

not inferior to the butyl ester of 2,4-D in its herbicidal properties. Although its chemical formula is not given in the article, it is said to be an ester of 2,4-D with low volatility. It is said to be preferable to the butyl ester of 2,4-D in some respects.

22. Synthesis of Gamma-Chlorocrotyl Ester of 2,4-Dichlorophenoxyacetic Acid (Krotilin) -- A New Herbicide

"Research on the Synthesis of Herbicides. Report 1. The Gamma-Chlorocrotyl Ester of 2,4-Dichlorophenoxyacetic Acid ('Krotilin')," by V. V. Dovlatyan, Chair of General Chemistry of the Armenian Agricultural Institute; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR-Khimicheskiye Nauki, Vol 12, No 2, 1959, pp 125-131

For the purpose of finding new and superior substitutes for the butyl ester of 2,4-dichlorophenoxyacetic acid (2,4-D), the hitherto unknown gamma-chlorocrotyl ester of this acid was synthesized. "Krotilin," as it has been named, differs from the butyl ester by its comparatively low volatility and its ease of manufacture; "Krotilin" surpasses 2,4-D as a herbicide, and in comparison with the sodium salt of 2,4-D, which is used in agriculture, it is three times more active.

The gamma-chlorocrotyl ester of 2,4-D can be obtained by four methods: preparation of the ester starting with the acid chloride of 2,4-D or the free acid and gamma-chlorocrotyl alcohol; by the action of the gamma-chlorocrotyl ester of chloroacetic acid on sodium 2,4-dichlorophenolate; and by the interaction of the sodium salt of 2,4-D with 1,3-dichlorobutene-2.

2,4-D is easily esterified with a slight excess of gamma-chlorocrotyl, butyl, and isoamyl alcohols without the use of a catalyst.

The sodium salt of 2,4-D reacts smoothly with 1,3-dichloro-butene-2 only in the presence of pyridine, which exerts a pronounced catalytic effect on the formation of the ester.

23. Growth Stimulants Beneficial to Propagation by Cuttings

"Application of Growth Stimulants During the Propagation of Fruit, Berry, Forest, and Decorative Plants by Means of Cuttings," R. Kh. Turetskaya, Institute of Plant Physiology imeni K. A. Timiryazeva of the Academy of Sciences USSR, Moscow, Fiziologiya Rasteniy, Vol 6, No 4, 1959, pp 494-499

A great number of physiologically active chemical substances can be used as plant growth stimulants, as experiments conducted in the Soviet Union and abroad have shown. The most effective chemicals stimulating root formation processes appear to be beta-indolylacetic acid (heteroauxin), beta-indolylbutyric acid (IMK), and alpha-naphthylacetic acid (NUK), as well as salts derived from these acids.

The effectiveness of growth stimulants with respect to the intensification of the root growth of cuttings depends on the physiological state and rooting capacity of the cuttings. Most young plants can be propagated by means of cuttings, but this ability disappears with age. Green cutting is the most frequently used method of vegetative reproduction. Woody cuttings should be used only for the propagation of plants which take root easily.

To facilitate the rooting of plant cuttings which take root with difficulty, it is desirable to condition the plants preliminarily by using a mixture of the growth stimulant and ascorbic acid.

24. Two Patented Processes For Synthesizing Growth Stimulant Beta-Indolylacetic Acid (Heteroauxin)

"Methods of Synthesizing Beta-Indolylacetic Acid (Heteroauxin)," by A. P. Terent'yev and N. A. Dzbanovskiy (Invention No 120217 and 120219); Moscow, Byulleten' Izobreteniy, No 11, 1959, pp 16-17

Invention No 120217: The process of synthesizing beta-indolylacetic acid by the condensation of indole with formalin and alkaline cyanide is characterized by the fact that, to increase the yield, the process is carried out in two stages so that formalin and alkaline cyanide are condensed initially in an anhydrous medium up to the formation of the potassium (or sodium) metal derivative of hydroxyacetonitrile, and then this derivative is condensed with indole in the presence of a stoichiometric quantity of water.

Invention No 120219: The process for synthesizing beta-indolylacetic acid (heteroauxin) from indole is characterized by the fact that, to simplify the process, indole is converted by the action of anhydrous formalin into beta-indolylmethylaniline, which is further treated by a solution of alkaline cyanide at an elevated temperature.

25. Preparation of Plant Growth Stimulant alpha-Naphthylacetic Acid and Its Methyl Derivative

"The Preparation of alpha-Naphthylacetic Acid and Its Methyl Derivative," by Yu. A. Baskalov, V. N. Volkov, and N. N. Mel'nikov; Moscow, Zhurnal Prikladnoy Khimii, Vol 32, No 6, Jun 59, pp 1409-12

Alpha-naphthylacetic acid and several of its derivatives have found a variety of uses in agriculture. The potassium salt is an active stimulant of root-formation and it is used in grafting and transplanting of mature trees. Another derivative, alpha-naphthylacetamide, has been used with success for preventing the falling of fruit from trees. However, of greater value to the national economy is the method of retarding the sprouting of potatoes and other vegetables during long storage. At present, the methyl ester of alpha-naphthylacetic acid is used for this purpose. Its chief advantages over other preparations are its high effectiveness and practically complete absence of any toxicity to man.

The authors have developed a method whereby a 70% yield of alpha-naphthylacetic acid can be obtained under optimal conditions by the condensation of naphthalene with monochloroacetic acid in the presence of a catalyst consisting of iron powder and potassium bromide. The esterification of alpha-naphthalylacetic acid with methyl alcohol in the presence of sulfuric acid at room temperature gives an almost quantitative yield of the methyl ester. The method developed is suitable for the preparation of the compounds in question in large quantities.

Nuclear Fuels and Reactor Construction Materials

26. Internal Circulation of Extractable Materials During Extraction With Tributylphosphate

"The Internal Circulation of Extracted Substances and the Calculation of Columns For Extraction With Tributylphosphate," by A. M. Rozen; Moscow, Atomnaya Energiya, Vol 7, No 3, Sep 59, pp 277-281

Displacement of one extracted substance by another in tributylphosphate and the resulting "internal circulation" of extracted substances are considered from the standpoint of the concentration gradients which arise and

the effects which the phenomena in question have on the design and operation of extraction columns. The extraction of uranyl nitrate in the presence of nitric acid and of extractable microimpurities and the separation of plutonium from uranium are discussed in detail.

27. Separation of Zirconium From Niobium by Method of Distribution Chromatography With Reversed Phases

"Separation of Mixtures of Zirconium With Niobium by the Method of Distribution Chromatography With Reversed Phases," by S. Sekerski and B. Kotlinska, Radiochemical Laboratory of the Institute of Nuclear Research, Polish Academy of Sciences (Warsaw); Moscow, Atomnaya Energiya, Vol 7, No 2, Aug 59, pp 160-162

A method has been developed for separating zirconium from niobium by a method of distribution chromatography, using tributyl phosphate adsorbed on siliconized silica-gel. The carrier-free radioisotopes Zr^{95} and Nb^{95} were used. Hyflo Supercel with grains having a diameter of approximately 0.08 mm was siliconized with dimethyldichlorosilane. Separation of zirconium from niobium was carried out with 4.6 M nitric acid. In the separation by this method, very pure niobium may be obtained, but the radiochemical purity of zirconium is no higher than 98%. To improve the separation of niobium from zirconium, the capacity of niobium to form complexes with hydrogen peroxide was utilized. It was established that the best results are obtained when a solution of 0.1-0.3% of hydrogen peroxide in 4.6 M nitric acid is used. In the procedures described, zirconium is washed out of the column, while niobium remains adsorbed.

It is concluded on the basis of the results obtained that separation of cations having chemical properties close to each other can be accomplished by applying distribution chromatography and using tributyl phosphate as the stationary phase. Because many cations present in the form of different salts (nitrates, chlorides, and bromides) are extracted by tributyl phosphate, it may be expected that the method described can be applied quite generally. At present, work is being conducted on the application of this method for the separation of rare-earth elements.

28. Concentration of B^{10} by Distillation of Boron Chloride

"Separation of Boron Isotopes By the Distillation of Boron Chloride," by N. N. Sevryugova, O. V. Uvarov, and N. M. Zhavoronkov, Corresponding Member, Academy of Sciences USSR, Scientific Research Physical Chemistry Institute imeni L. Ya. Karpov; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 5, 11 Jun 59, pp 1044-1046

Separation of boron isotopes can be accomplished by a number of methods, i.e., electromagnetically, by thermal diffusion, vapor diffusion, chemical isotope exchange, and distillation. Among the methods enumerated, distillation appears to be of the greatest advantage from the economic standpoint. On the basis of the experiments described, which were conducted in equipment especially designed for the purpose, calculations were made indicating that enrichment of B^{10} by the distillation of BCl_3 can be carried out at a cost low enough to warrant industrial application of the method. It appears from the calculations that the maximum separation capacity of a column for the distillation of boron trichloride corresponds to 800 theoretical plates. Under these conditions, a product containing 75 mol % of B^{10} Cl_3 can be obtained.

29. Synthesis of Allyl Esters of Some Alkane-, Alkene-, and Chloroalkanephosphinic Acids

"Allyl Esters of Several Alkane-, Alkene-, and Chloroalkanephosphinic Acids," by L. Z. Soborovskiy and Yu. M. Zinov'yev; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2152-54

The allyl esters of alkanephosphinic acids have acquired importance as starting materials for the synthesis of polymers. The esters of various alkane- and alkenephosphinic acids are obtained by the action of allyl alcohol on the acidchlorides of the corresponding phosphinic acids or by reacting according to the Arbuzov method triallylphosphite with halogenated alkanes. The allyl ester of octanephosphinic acid is obtained by the interaction of free acid with allyl alcohol in boiling toluene in the presence of 1.3% para-toluolsulfonic acid. The allyl esters of chloroalkanephosphinic acids have been described by several authors in the past.

In the present investigation, the allyl esters of several alkane-, alkene-, and chloroalkanephosphinic acids have been synthesized using the acid dichlorides of the corresponding acids which were obtained by the oxidative chlorophosphination of paraffinic and olefinic hydrocarbons (heptane, cyclohexane, propylene, and 1-butene).

Since several acid dichlorides obtained by this method are mixtures of isomeric compounds, the esters synthesized from them are made up of isomers, differing by the position of the phosphorus-containing radical in the hydrocarbon group.

By the dehydrochlorination of the acid chloride of chloropropanephosphinic acid, the acid chloride of propenephosphinic acid was obtained which was later converted into the allyl ester of propenephosphinic acid (the latter may possibly contain admixtures of isomeric compounds).

The properties of the synthesized diallyl esters of heptane-, cyclohexane-, chloropropane-, chlorobutane-, and propenephosphinic acids are listed in a table.

30. Research on RCdX Cadmium Compounds

"Crystalline Aliphatic Organocadmium Compounds of the RCdX Type," by N. I. Sheverdina, I. Ye. Paleyeva, Ye. D. Delinskaya, and K. A. Kocheshkov, Corresponding Member of the Academy of Sciences USSR, Physical Chemistry Institute imeni L. Ya. Karpov; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 2, 1959, pp 348-350

Up to now, organocadmium compounds had not been isolated in an individual crystallized form. The authors in this article have shown the possibility of synthesizing organocadmium compounds and isolating them on the basis of the reaction between dialkylcadmium and cadmium salts according to the equation:

$$R_2Cd + CdX_2 \longrightarrow 2RCdX$$

The reactions were carried out in absolute ether using anhydrous cadmium halides. The following compounds were obtained in a crystalline form: ethylcadmium chloride, ethylcadmium bromide, ethylcadmium iodide, and n-butyl-cadmium bromide.

31. Process for Preparing Mixture of Unsymmetric Tetraalkyldithiopyrophosphates and Trialkyldithiophosphates

"Method of Obtaining a Mixture of Unsymmetric Tetraalkyldithiopyrophosphates and Trialkyldithiophosphates," by N. N. Mel'nikov, K. D. Shvetsova-Shilovskaya, and M. Ya. Kagan (Invention No 120216); Moscow, Byulleten' Izobreteniy, No 11, 1959, p 16

The process of preparing a mixture of unsymmetric tetraalkyldithiopyrophosphates and trialkyldithiophosphates is characterized by the fact that tetraalkyldithiophosphondisulfide, in the presence of a solvent or without it, is mixed with trialkylphosphate and the mixture is heated thereafter.

32. [illegible]

[illegible]

32. Process for Preparing O,O-Diethyl-, O,O-Dimethyl-, and O-Ethyl-O-Methyl-O-(4-nitrophenyl)-thiophosphates

"A Method of Synthesizing O,O-Diethyl-, O,O-Dimethyl-, and O-Ethyl-O-Methyl-O-(4-nitrophenyl)-thiophosphates," by N. N. Mel'nikov, Ya. A. Mandel'baum, Z. M. Bakanova, S. L. Warshavskiy, and L. P. Hofman (Invention No. 120215); Moscow, Byulleten' Izobreteniy, No 11, 1959, p 16

The process for obtaining the compounds mentioned in the title is characterized by the fact that the corresponding dialkylchlorothiophosphate is mixed with para-nitrophenol in the presence of triethylamine at 10-40° C.

33. Preparation of Trichlorophosphazo Compounds

"The Reaction of Phosphorus Pentachloride With Acid Dichlorides and Diesters of Arylsulfonamidophosphoric Acids," by Ye. S. Levchenko, I. N. Zmurova, and A. V. Kirsanov, Institute of Organic Chemistry of the Academy of Sciences Ukrainian SSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2262-2267

The object of this research was to examine the feasibility of obtaining the corresponding trichlorophosphazo-compounds from the acid dichlorides of arylsulfonamidophosphoric acids by the reaction

$$RSO_2NHPOCl_2 + PCl_5 \longrightarrow HCl + POCl_3 + RSO_2N{=}PCl_3$$

The experiments showed that this reaction readily takes place with the acid dichlorides of o-, m-, and p-nitrophenylsulfonamidophosphoric acids at 130-135° in 10-15 minutes, giving yields of 47-80%, and with the phenyl ester of N-(dichlorophosphinyl)-monoamide of p-benzoyldisulfonic acid at 115-120° in 20-25 minutes, giving a yield of 45%.

The corresponding trichlorophosphazosulfonaryls are not formed by the reaction of phosphorus pentachloride with acid dichlorides of arylsulfonamidophosphoric acids, molecules of which do not contain substituents of the 2i type in the aromatic nucleus. Apparently the reaction takes place only when such substituents are present. Their position with respect to the $SO_2NHPOCl_2$ group is immaterial.

Diphenoxychlorophosphazosulfonaryls are formed by the reaction of phosphorus pentachloride with the diphenyl esters of arylsulfonamidophosphoric acids. The reaction is independent of the nature and the position of the substituents in the aromatic nucleus of the sulfonic acid.

34. Synthesis of Trialkylgermanium Fluoride

"Synthesis of Trialkylgermanium Fluoride," by B. M. Gladshteyn, V. V. Rode, and L. Z. Soborovskiy; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2155-2156

A new method is reported for obtaining trialkylgermanium fluoride by the direct action of liquid hydrogen fluoride on tetraalkylgermane:

$$GeR_4 + HF \longrightarrow R_3GeF + RH$$

where $R = CH_3$ and C_2H_5.

The reaction takes place smoothly under mild conditions and results in a quantitative yield of monofluorotrialkyl-germane. Further action of the hydrogen fluoride on trialkylgermanium fluoride even under more vigorous conditions does not cause splitting off of additional alkyl groups. Thus, this reaction permits the synthesis of pure trialkylgermanium fluoride without admixtures of di- and trifluorogermanes.

The initial tetraalkylgermanes were obtained by organomagnesium synthesis from germanium tetrachloride and the corresponding alkylmagnesium halide. By means of this method, tetramethylegermane was obtained in a practically quantitative yield under the given conditions in absolute dibutyl ether.

35. Neoplatyphylline: A New Cholinolytic and Spasmolytic Alkaloid

"A New Alkaloid Isomeric With Platyphylline," by A. V. Danilova, L. M. Utkin, G. V. Kozyreva, and Yu. I. Syrneva, All-Union Scientific Research Chemical Pharmaceutical Institute imeni S. Ordzhonikidze, Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2432-2436

Neoplatyphylline was obtained by the treatment of alcoholic mother liquors under industrial conditions in connection with the process of separation and crystallization of platyphylline bitartrate. Neoplatyphylline has the same over-all composition and the same functional groups as platyphylline. The infrared absorption spectra of the two alkaloids differ only slightly. Nevertheless, neoplatyphylline and its salts differ from platyphylline and its salts in their physical properties.

Pharmacological tests showed that neoplatyphylline exhibits pronounced cholinolytic and spasmolytic activity. It causes dilation of the pupils and relaxation of smooth muscles. It is quite close to platyphylline in its action and activity, but its toxicity is twice that of platyphylline.

36. Synthesis of Aliphatic Carbylaminohalides

"Carbylaminohalides. I. Aliphatic Carbylaminochlorides," by K. A. Petrov and A. A. Neymysheva; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2165-2168

Very little is known about aliphatic carbylaminochlorides. Only three compounds of this type are known up to the present time: ethyl-, beta-chloroethyl-, and trichloromethylcarbylaminochlorides. The first substance was prepared by the chlorination of ethylisonitrile; the second, by the chlorination of beta-chloroethylisothiocyanate; and the third, by the thermal decomposition of trichloronitrosomethane. Only general indications with regard to their reactivity are available, as far as knowledge of the chemical properties of these compounds is concerned.

In this article, the authors describe the hitherto unknown methylcarbylaminochloride, give information on a method for the preparation of intermediate products for the synthesis of trichloromethylcarbylaminochloride, and report results of a study of some of the properties of aliphatic carbylaminochlorides.

Methylcarbylaminochloride was obtained by the chlorination of methylisothiocyanate in ether at 0° C. Methyl- and trichloromethylcarbylaminochlorides do not react with hydrogen sulfide, sodium sulfide or copper sulfide. Methylcarbylaminochloride liberates iodine quantitatively from acidified solutions of potassium iodide. Complete substitution of chlorine atoms with the amine residues takes place by the action of aniline on trichloromethylcarbylaminochloride.

37. Synthesis of New Phosphorous Acid Esters

"The Preparation and Isomerization of Mixed Esters of Di-beta, beta'-dichloroisopropylphosphorous Acid. V.," by V. K. Khayrullin, A. I. Ledeneva, and V. S. Abramov, Kazan Chemicotechnological Institute; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2355-2359

The stated purpose of this research was to obtain mixed esters of phosphorous acid possessing halogen-containing ester radicals and to study the effect of halogens on their properties.

The reaction between glycerol alpha, gamma-dichlorohydrin and phosphorus trichloride was studied. It resulted in the formation of the following products: the acid dichloride of beta, beta'-dichloroisopropylphosphorous acid, the acid monochloride of beta, beta'-dichloroisopropylphosphorous acid, and the di-beta, beta'-dichloroisopropyl ester of beta, gamma-dichloroisopropylphosphinic acid which formed by the isomerization of tri-beta, beta'-dichloroisopropylphosphite.

The mixed dialkyl-beta, beta'-dichloroisopropyl esters of phosphorous acid were synthesized and characterized.

Isomerization of the mixed phosphites by the corresponding alkyl iodides takes place smoothly with the splitting off of the unsubstituted aliphatic alkyl and the formation of alkyl-beta, beta'-dichloroisopropyl esters of alkylphosphinic acid.

38. Hammett's Equation to Establish Ionization Constant of Organophosphorus Acids

"The Application of Hammett's Equation to the Ionization Constant of Organophosphorus Acids in 7 and 80% Alcohols," by T. A. Mastryukova, T. A. Melent'yeva, A. E. Shipov, and M. I. Kabachnik, Institute of Organoelemental Compounds of the Academy of Sciences USSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2178-2182

The ionization constants of a number of organophosphorus acids in 7 and 80% alcohol were determined. Using these constants, the authors established that in accordance with Hammett's equation the ionization constant indexes are linearly related to the constants σ which were calculated earlier and are specific for organophosphorus compounds.

The σ constants were determined for the C_6H_5O- and p-$CH_3C_6H_4O$-groups bound to the phosphorus atom.

39. Synthesis and Characteristics of Atropine-Like Substances

"The Synthesis of Cyclic Amino-Alcohols Possessing Cholinolytic Activity," by S. G. Kuznetsov and N. M. Libman, All-Union Scientific Research Sanitary-Chemical Institute of the Academy of Medical Sciences USSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2421-2428

S. G. Kuznetsov, in his report (presented at an all-union conference held at Riga, 26-29 June 1957) entitled "On the role of several physicochemical and structural factors in the interaction mechanism of atropine-like substances with M-cholinoreactive systems" advanced the hypothesis

that cholinolytic substances which act similarly to atropine and belong to the group of aminoalkyl esters of carboxylic acids interact in the organism with cholinoreactive systems while in a cyclic ionic form in which the distance between the nitrogen atom and the carbon atom associated with the cyclic radicals is fixed to a considerable degree by intramolecular ion-dipole interaction and is approximately equal to 3.7 Å.

From this, the corollary follows that a distance equal to or relatively close to 3.7 Å should be the distance between some definite points of a cholinoreactive system and that this distance is essential for cholinolytic molecules.

To find experimental confirmation of this hypothesis, the authors undertook the synthesis of cyclic structures analogous to that of dimethylaminoethyl ester of benzoic acid but with a more rigidly fixed distance between the N and C because of the presence of a covalent bond instead of the comparatively weak ion-dipole interacting pair.

Synthesized for the first time were: 1-methyl-diphenylmethylol-piperideine-3 and 3-diphenylmethylol-dimethylaminocyclohexene-2, several of their salts and the ethyl ester of 3-dimethylamino-1-cyclohexene-carboxylic acid which formed as an intermediate product of the synthesis.

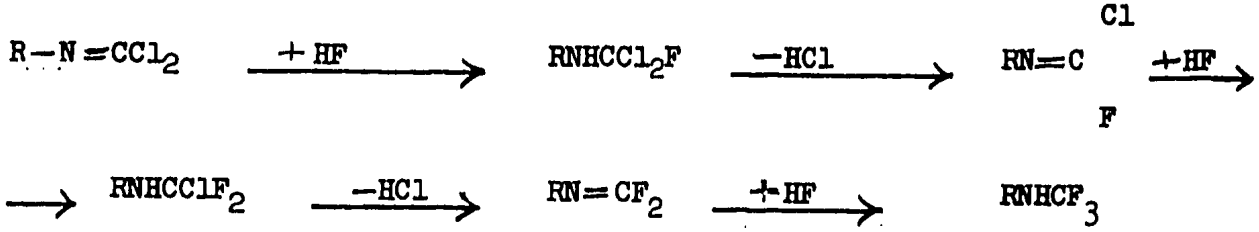
On the basis of a comparison of the cholinolytic activity of the obtained substances, the conclusion was reached on the substantial effect on the physiological activity mentioned of the distance between the nitrogen atom and the carbon atom which is bound to the cyclic radical.

40. Synthesis of Secondary Amines Containing Trifluoromethyl Group

"Carbylaminohalides. II. The Synthesis of Secondary Amines with a Trifluoromethyl Group," by K. A. Petrov and A. A. Neymysheva; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 7, Jul 59, pp 2169-2173

The only example of a secondary amine with a trifluoromethyl group on the nitrogen known at present is hexafluoro-dimethylamine, which was first obtained in small yields by the fluorination of cyanogen iodide with iodine pentafluoride, and later by the addition of hydrogen fluoride to trifluoromethylcarbylaminofluoride while heating the reagents to 150° C for 15 hours. The second method is recommended as a general procedure for obtaining secondary amines with a trifluoromethyl group. Nevertheless, owing to the inadequate availability of carbylaminofluorides, it likewise has very limited possiblities. Carbylaminofluorides are usually obtained by the thermal decomposition of tri-(perfluoroalkyl)-amines. The perfluorocarbylaminofluorides formed in this manner can be rearranged by the addition of hydrogen fluoride only into secondary amines containing perfluorinated radicals.

Petrov and Neymysheva have developed a new method for obtaining secondary amines containing the trifluoromethyl group, which is based on the interaction of hydrogen fluoride with carbylaminochlorides. As a result of the successively occurring reactions of addition of hydrogen sulfide to carbylaminohalides and splitting off of hydrogen chloride from the resulting substances, secondary amines containing a trifluoromethyl group are finally obtained:



The reaction of carbylaminochlorides with hydrogen fluoride takes place energetically in the cold and, depending on the reaction conditions, secondary amines or polymers of carbylaminofluorides are formed. Thus, when the reaction is conducted in ether with an excess of hydrogen fluoride, alkyltrifluoromethylamines are formed, but when the reaction is carried out in ethyl chloride or without a solvent, the chief products of the reaction are polymers of carbylaminofluorides.

The reactions between hydrogen fluoride and phenyl-, p-tolyl-, beta-chloroethyl-, and trichloromethylcarbylaminochlorides were studied. The following compounds were isolated: phenyltrifluoromethylamine (68.5%), p-tolyltrifluoromethylamine (70%), hexafluorodimethylamine (85%), and the acid fluoride of beta-chloroethylcarbamic acid.

Radiation Chemistry

41. Control of Composition of Enrichment Products of Beryllium Ores and Fluorites by Bombardment With α-Particles

"Quantitative Control of Products of the Enrichment of Beryllium and Fluorite Ores by α-Bombardment," by I. N. Plaksin, Corresponding Member, Academy of Sciences USSR; V. N. Smirnov; and L. P. Starchik; Moscow, Doklady Akademii Nauk SSSR, Vol 127, No 3, 1 Jul 59, pp 618-619

The photonuclear reaction (α,n) had been proposed by A. M. Gaudin and G. H. Pannel for the quantitative determination of beryllium in ores. On the basis of the investigation carried out by the authors of this article, the reaction

for the determination of beryllium in the quantitative control of beryllium ore concentrates, and the reaction

$$F_9^{19} + He_2^4 \longrightarrow Na_{11}^{22} + n_0^1$$

for the control of fluorite ore concentrates are proposed. When these reactions are applied, the yield of neutrons is proportional to the content of beryllium or fluorine or concentrates in question. Po-210 was used as a source of α-radiation. The method in question can also be used for the determination of boron.

Radiochemistry

42. All-Union Symposium on Radiochemistry

"An All-Union Symposium on Radiochemistry," by V. N. Shchebetkovskiy; Moscow, Atomnaya Energiya, Vol 7, No 2, Aug 59, pp 175-176

A symposium dealing with the state in which microquantities of radioactive elements are present in solutions was conducted at Leningrad 3-5 March 1959. More than 200 representatives of scientific research institutes located at Moscow, Leningrad, Kiev, Novosibirsk, Tbilisi, and Gor'kiy participated in the symposium.

In a report by I. Ye. Starik entitled "The Problem Concerning the Molecular State of Microquantities of Radioelements in Solutions," it was pointed out that until recently the molecular state of radioelements in solution received very little attention: only the ionically disperse, colloidal, and pseudo-colloidal states were investigated. By using the method of adsorption on hydrophobic nonionic surfaces such as those of ftoroplast-4 or paraffin in combination with the investigation of the effect exerted by different salts on adsorption, it was possible to establish the presence of molecular forms of zirconium, polonium, americium, and promethium in different solutions containing these elements in microquantities.

Several reports (by I. Ye. Starik, N. I. Ampelogova, F. L. Ginzburg, L. I. Il'menkova, I. A. Skul'skiy, and L. D. Sheydina) dealt with the results of investigations of the state in which ultrasmall quantities of radioelements are present in solutions. By using a number of methods (those of adsorption and desorption, ultrafiltration, centrifuging, electrophoresis, and deposition on metals), the authors of the reports determined the pH regions in which radioelements occur in the ionic, colloidal, and pseudo-colloid states. It was established that zirconium is present in

an ionically disperse state up to pH = 1.5, americium up to pH = 5, and protactinium up to pH = 3. Transition of zirconium into a truly collodial state takes place at pH = 4, of americium at pH = 9, and of protactinium at pH = 5. The states which polonium assumes in an extensive range of pH values (1-14) were also investigated.

M. N. Yakovleva and M. A. Shurshalina proposed to use the dialysis method for the investigation of the state of uranium carriers in natural waters. An advantage of this method is its simplicity and applicability under field conditions.

Several communications dealt with the investigation by the ion-exchange method of the state of radioelements in solutions. A paper by V. I. Paramonova and Ye. F. Latyshev reported results obtained in work on complexes formed by tetravalent ruthenium with chloride ions. A report by K. B. Zaborenko, A. V. Zaval'skaya, and V. V. Fomin dealt with the application of the ion-exchange method for the determination of dissociation constants of oxalate complexes of cerium. By applying the method of ion exchange in combination with determinations of solubility, A. I. Moskvin established that formation of complexes by plutonium and americium with anions of oxalic, phosphoric, and ethylenediaminetetraacetic acid takes place stepwise in such a manner that the ratio between individual types of complex ions depends on the concentration of the complex-forming component. It was furthermore established that the tendency toward complex-formation exhibited by different ions of plutonium drops as the ionic potential of these ions becomes smaller.

A. M. Trofimov and L. N. Stepanova proposed a new method for the determination of the magnitude of the charge of ions of radioelements in solutions by using ion-exchange resins with different capacities for swelling. The method in question was applied to determine the dependence of the charge of zirconium in nitric acid solutions on the acidity of these solutions. It was established that by using the method mentioned, one can follow the course of the polymerization of ions of radioelements in solutions.

When the process of extraction is investigated, it is very important to determine the state which the compound being extracted assumes in the organic phase. It was established that the degree of hydration of uranyl nitrate in a number of ethers and esters drops with the transition from the first member of a homologous series to subsequent (higher) members. It was also found that addition of benzene or chloroform brings about a lowering of the degree of hydration (V. M. Vdovenko and Ye. A. Smirnova). The degree of hydration of nitric acid in diethyleneglycol dibutyl ether was found to be equal to 1.72 (V. M. Vdovenko and N. F. Alekseyeva), while its degree of solvation was found to be equal to unity in determinations made by the dilution method (V. M. Vdovenko and A. S. Krivokhatskiy).

A. K. Lavrukhina reported that a determination of the dependence of the coefficient of distribution between the organic and aqueous phase on the concentration of the elements makes it possible to establish the state in which substances are present in solutions and also to determine the concentration regions in which formation of complexes, polymerization, or dissociation of the substances being extracted takes place. In an investigation of the extraction of hexavalent tungsten with aniline from hydrochloric acid solutions, V. I. Kuznetsov and P. D. Pitov established that there is a sharp rise in the coefficient of distribution after molybdenum or vanadium has been added to the solution. The phenomenon of combined extraction which takes place and results in an increase of the coefficient of distribution was explained by the authors of the paper by assuming that there is formation of mixed isopolyanions. The phenomenon of combined extraction can be applied for the investigation of the state in which substances are present in dilute solutions.

A special session of the symposium dealt with investigations pertaining to the state of hot atoms and related problems in radiation chemistry. A. N. Nesmeyanov reported on the substitution of hydrogen atoms in benzene by the recoil atoms P^{32}, As^{76}, and Sb^{124}. He succeeded in demonstrating that the formation of phenyl derivatives may take place by reactions of the superthermal type. V. G. Dzantiyev reported on chemical reactions with cyclanes of recoil atoms formed in the nuclear reactions Li^6 (n, α) T and N^{14} (n, p) C^{14}. It was established that in addition to the formation of tagged molecules of the initial compounds, tagged products of decomposition and condensation are obtained. The coefficient of the chemical conversion of hot atoms is as high as 30-40% in the case of tritium and 60-80% in the case of carbon. P. I. Artyukhin, in investigating the effects of NO_3^- and H^+ on the velocity of the reduction of hexavalent plutonium under the action of its own alpha-radiation was led to the conclusion that the reduction takes place as a result of reactions with hydrogen peroxide and nitrous acid formed because of irradiation.

In the course of the general discussion, it was pointed out that investigation of the state in which radioelements occur in solutions is of first-rate importance for the present-day theory of radiochemistry and also for practical applications of radiochemistry. The methods by means of which the problems in question are being investigated were subjected to critical discussion. The participants at the symposium noted the necessity of a more rigid thermodynamic approach and of the simultaneous application of several methods in order that the question in regard to the state of every element may be solved in an unequivocal manner. The importance of further investigation of the molecular state of radioactive elements in solutions was pointed out and also the necessity of developing new methods for establishing that the elements are in this state. The desirability was emphasized of comparing results that apply to microquantities with results obtained when macroquantities of the same substances are investigated by the same method. It was pointed out that work on the state in which hot atoms are present in solutions must be expanded. Closer coordination of work on the chemistry of hot atoms with work on radiation chemistry was recommended.

[SIR Note: This report supplements the information given in Item 31, SIR T-29.]

43. Development of Indicators and Controllers Based on Use of Radioactive Isotopes

"News Item -- USSR" (unsigned item); Moscow, Atomnaya Energiya, Vol 7, No 3, Sep 59, p 299

The Tallin Experimental Plant of Control and Indicator Devices (Estonian SSR) is engaged in the development of 12 types of devices the operation of which is based on the use of radioactive isotopes. The devices in question are to be employed in the automation of processes in the metallurgical, chemical, mining and smelting, food processing, and other industries, as well as in transportation. The first shipment of automatic controllers of the level of petroleum products has gone out.

III. EARTH SCIENCES

44. Activities of Hungarian Geologists Discussed, International Mesozoic Conference in September

"The Achievements of the 'Scientific Miners' -- Geologists From 17 Countries Participate in Jubilee Conference of the [Hungarian] Geological Institute," by Istvan Vig; Budapest; Magyar Nemzet, 1 Sep 59, p 3

In 1959, the Hungarian State Geological Institute celebrates the 90th anniversary of its founding. On this occasion, a very important international Mesozoic conference will be held in the institute [in September].

We spoke about the work of our geologists and about the significance of the international Mesozoic conference with Dr Karoly Ferencz, chief geologist and deputy director of the Hungarian State Geological Institute.

The most important research areas of the institute are the Mecsek, Matra, and Esperes-Tokaji ranges, the Bakony Mountains and environs, and the Dorog coal basin. The researches in the Mecsek are aiming primarily at an increase in coal reserves; but they are also looking for uranium and iron ore. The most recent iron ore strike was near Zengovarkony.

Our bauxite and manganese ore deposits in the Bakony are significant. Most recently, traces of magnesite and magnetite have been found in the serpentines near Felsocsatar in Vas Megye. Traces of rare [inert] gas have been found near Szombathely, and there is also the possibility of tapping hot medicinal waters here.

The institute has done significant work on water supplies, on supply of vulcanic rock, and on limestones and dolomites for cement. A great master in research on road building stones is Dr Lajos Jugovics, a university instructor, who works at the institute.

Hungarian researchers are now traveling in the deserts of China and Mongolia, and the deputy director of the institute spent 2 years in Albania.

Outstanding scientists from 17 European countries will attend the 9-day international Mesozoic conference. About 50 papers will be read concerning this geological period. Papers will be read by the following Hungarian geologists: Elemer Vadasz, Ference Horusitzky, Kalman Balogh, Jeno Noszki, and Laszlo Majzon. Foreign speakers will include O. Sh. Vialov and M. Makhel of the Soviet Union.

IV. ELECTRONICS

Acoustics and Audio-Frequencies

45. Infrasonic Hydrophones.

"Calibration of Infrasonic Hydrophones by the Reciprocity Method in a Small Water-Filled Chamber," by A. N. Golenkov; Moscow, Izmeritel'naya Tekhnika, No 8, Aug 59, pp 47-51

The All-Union Scientific Research Institute of Physicotechnical and Radio Engineering Measurements has developed a device for calibrating infrasonic piezoelectric hydrophones, utilizing the reciprocity method.

Calibration in the range of infra- and low-sonic frequencies was carried out in a closed, small chamber filled with water. The determination of the parameters of reciprocity is reduced to the measurement of acoustic yielding of the system, involving a chamber and transducer which, at low frequencies (up to the first resonant frequency of the system), has a flexible nature. The water-filled measuring chamber was in the form of a thick-walled (40 mm) steel cylinder having an internal diameter of 130 mm and a length of 200 mm. Inside the chamber were mounted a reversible transducer, auxiliary sonic radiator, and the examined hydrophone. The auxiliary radiator and reversible transducer were fed from the same oscillator.

Calibration was carried out in the range of frequencies from 5 to 400 cycles and was conducted for various conditions. Despite the fact that the dynamic flexibility of the system was fluctuating between the values of $0.197 \cdot 10^{-6}$ to $0.276 \cdot 10^{-6}$ $cm^4 \cdot sec^2/g$, reproducibility was better than 0.5 db. Calibration error did not exceed 2%.

Antennas

46. Slotted-Rod Surface-Wave Antenna as Radar Antenna

"Investigation of the Technical Applicability of Cylindrical Surface-Wave Antennas as Radar Antennas," by R. Jaehn, Berlin; Berlin, Nachrichtentechnik, No 9, Sep 59, pp 418-426

The article discusses the applicability for radar of a type of surface-wave antenna consisting of a cylindrical metal rod with circular parallel grooves. The advantages of this type of antenna are the light weight, low

aerodynamic drag, and relatively simple manufacture. The surface wave can be excited preferably by means of a horn radiator at one end of the antenna. Antenna properties are computed for two variations, one with a strictly radial polarization and a second with a strong conical radiation diagram, having a sharp indentation in the direction of the elongated antenna axis. Possible uses of each type and of combinations of the two types are discussed.

Communications

47. USSR Aiming at 25,000 Amateur Radio Stations in 1961

"Aiming at 25,000 Amateur Radio Stations" (unsigned article); Moscow, Radio, No 8, Aug 59, pp 1-2

The article contains the following passages:

"There should be 25,000 Soviet amateur radio stations on the air at the end of 1961. The Volunteer Society for Cooperation With the Army, Air Force, and Navy (DOSAAF), a patriotic defense organization, is now struggling to fulfill the aims of the resolution of the Fourth Conference. The problem of substantially increasing the number of amateur radio stations today is not merely a sporting effort; it is of great significance to the national economy.

"During the past few years, our radio amateurs have achieved substantial success in their effort to establish 25,000 radio stations. The number of short-wave and ultrashort-wave stations has increased several times in the USSR; tens of thousands of young men and women have fulfilled the norms as prescribed by the unified sports classification during participation in various competitions. There are more than 50 radio clubs in the USSR which possess 100 transmitters or more.

"From 1 September 1959 on, the Soviet radio amateurs will operate on somewhat revised frequency ranges: 7 -7.1, 3.5 - 3.65, 28-29.7, 114- 146, and 420-435 Mc. This will require a considerable improvement in the quality of radio station operation. The club councils, the bureaus of short-wave and ultrashort-wave sections should begin a decisive struggle for the maintenance of radio equipment in the best possible conditions. Instability of transmitter frequency, low quality of modulation, the ac background noise, and other defects which interfere with the operation of adjacent stations should be looked upon as an unpermissible occurrence in the air."

48. Television Receiver "Yenisey-2"

"Television Receiver 'Yenisey-2'" (unsigned article); Moscow, Radio, No 8, Aug 59, pp 42-43, 59

One of the plants of the Krasnoyarsk Sovnarkhoz is producing a 12-channel television receiver "Yenisey-2." The set has 16 tubes, 8 semiconductor diodes, and the picture tube 35LK2B, with a 280 x 210 mm screen. Sensitivity of the set is not less than 200 microvolts, and selectivity with respect to adjacent channel is not less than 20 db. The fineness of definition varies from the center to the edge of the screen in the following manner: in horizontal direction, from 400 to 350 lines; and in vertical direction, from 450 to 350 lines. The power amplifier output is 1 w, and the sound reproduction is in the range of 100 to 6,000 cycles. The "Yenisey-2" television receiver is assembled on the principle of the common circuit. The radio frequency amplifier, mixer, and local oscillator are incorporated in the unified 12-channel selector switch unit. The video IF amplifier is built with three pentode tubes of type 6Zh1P. Signal detection is accomplished with semiconductor diodes D2-V. The two-stage video amplifier is built with tubes 6Zh1P and 6P15P.

The over-all dimensions of the receiver are 525 x 450 x 415 mm, and it weighs 24 kg. The power consumption is about 150 w from a 127- or 220-v ac power line.

Computers

49. Operator Method for the Synthesis of Algorithmic Systems Proposed

"Operator Method for the Synthesis of Algorithmic Systems," by A. D. Zakrevskiy; Gor'kiy, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiofizika, Vol 2, No 2, Mar/Apr 59, 306-315

Peculiarities of a sequence of information transformations are considered, and the requirements are determined for the automat converting the information. A method is proposed for the synthesis of digital automats introducing the formal transition from the conditions of operation, given in the form of an algorithmic resolution of the convertor operator, to the structure of the automat.

Experimental Methods, Instruments, and Equipment

50. Frequency Measurement of Molecular Oscillator

"System for Computation of Frequency of Molecular Oscillator With the Aid of a Standard Quartz Oscillator," By A. Ya. Leykin; Moscow, Izmeritel'naya Tekhnika, No 8, Aug 59, pp 43-44

The Khar'kov State Institute for Measures and Measuring Instruments has developed a special device for comparing the frequency of a molecular oscillator with that of a high-stability quartz oscillator. The measurement of molecular oscillator frequency in the range 23,170 Mc was carried out with the aid of a standard 100-kc quartz oscillator and an auxiliary 3.1-Mc oscillator.

The signal from the 3.1-Mc oscillator is multiplied 7,700 times with the aid of x11 and x700 frequency multipliers and mixed with signal from the molecular oscillator. The resulting difference frequency is amplified and fed to the first counting device. The frequency from the standard oscillator, after multiplication by the factor of 374, is mixed in a second mixer with the frequency from the x11 multiplier. The difference frequency from the mixer is amplified and fed to the second counter device. From the reading of the two counters, the ratio of the molecular oscillator frequency to that of the standard oscillator frequency is easily computed with the aid of a simple formula. The rms error for this type of measurement is about $1 \cdot 10^{-10}$.

51. Photodiodes for Registration of Low Intensity Signals

"Optimum Working Conditions of Photodiodes for Registration on Low Intensity Signals," by N. A. Vitovskiy, P. I. Maleyev, and S. M. Ryvkin, Physicotechnical Institute, Academy of Sciences, USSR; Moscow, Radiotekhnika i Elektronika, No 8, Aug 59, pp 1387-1392

This investigation has shown that the optimum conditions for use of photodiodes to register low intensity signals is secured when the diode is kept at low temperature. The measurements were conducted at the temperature of liquid nitrogen (77°K) and liquid helium (4.2°) with the FD-2 photodiode having an exposed surface. If the photodiode is arranged to operate under the rectifying mode, then very satisfactory results are obtained even for cooling to only -40°C. For practical purposes, "dry ice" (-78°C) is a convenient cooling agent.

52. Discharge in Nonuniform Field

"Discharge Ignition in Nonuniform Fields at Low Gas Pressure," by L. G. Guseva, All-Union Electrical Engineering Institute; Moscow, Radiotekhnika i Elektronika, No 8, Aug 59, pp 1260-1266

In this work, the voltage of discharge ignition was investigated for five different types of nonuniform fields and for various ratios of geometrical parameters of these fields. The effect of electrode polarity on the voltage of discharge ignition was also determined. The nonuniform fields in the discharge gap were created with the help of electrodes of various configurations. Such electrodes were mounted on specially designed anode leads able to withstand a voltage of 100 kv. The field intensity distribution in the gap between the electrodes was determined by plotting equipotential surfaces.

The results of measurements of all investigated types of nonuniform fields contain the following common elements: for highly nonuniform fields, when both electrodes have different configurations, a decided dependence of ignition voltage on the polarity of electrodes is observed; the ignition voltage is not determined by the distance between the most remote spots on the electrodes, but by the length of the path fulfilling the conditions for maintenance of independent discharge, i.e., requiring that a considerable portion of positive ions formed by the primary electrons fall on the same section of cathode from which the electrons were emitted; dielectric strength of the discharge gap at lower pressures is limited by the field emission phenomenon, beginning with the anode voltage between 200-500 kv/cm. The pressure range investigated was from 0.12 to 0.002 mm Hg.

53. Charge Concentration in Plasma of High-Frequency Discharge

"Checking the Validity of the Probe Method for Measurement of Charge Concentration in High-Frequency Discharge," by S. M. Levitskiy, and I. P. Shashurin, Kiev State University; Moscow Radiotekhnika i Elektronika, No 8, Aug 59, pp 1238-1243

An experiment was conducted to check the validity of the probe method for measuring the charge concentration in a high-frequency discharge. The method of the cavity resonator was selected for control purposes. The investigation was conducted on a discharge initiated in a cylindrical glass tube 3.6 cm in diameter, which was placed in a demountable toroidal resonator. The self-resonant frequency of the resonator, in absence of discharge, was 465 Mc. At the top and bottom ends of the tube were mounted two pairs of cylindrical probes 5 mm long and 0.2 mm in diameter. The probes were placed parallel to the axis of the tube and at a distance of

5 mm from it. The resonator was excited with an adjustable decimeter wave oscillator. The cathode end of the tube consisted of a heated tungsten cathode and a tantalum ring. A dc discharge was induced between the hot cathode and anode and a high-frequency discharge between the cold ring and anode. The tube was filled with saturated mercury vapor. The temperature of the equipment was maintained at 25°C with the aid of a special chamber. The probe measurements of the dc and high-frequency discharge were conducted with the aid of single and double probes.

The results of the experiment have shown that the method of the single probe is fully adaptable for measurement of charge concentration in the plasma of high-frequency discharge.

54. Zeiss High-Speed Oscilloscope Measures Millimicroseconds

"On Measurements in the Millimicrosecond Range," by W. Meinel, Jena; Berlin, Nachrichtentechnik, No 9, Sep 59, pp 405-410

A description is given of a laboratory instrument developed at Carl Zeiss, Jena. The electrical process to be measured passes successively through the attenuator, delay circuit, and pulse amplifier, the latter connected to the vertical deflection plate of the display tube. The the same time, the trigger amplifier and pulse shaper activate the time-base section and the brightness control. The delay circuit guarantees that the process to be measured reaches the vertical-deflection plate only after the time-deflection plate has been triggered.

With the sweep generator in current use, time scales of three millimeters line length per $1 \cdot 10^{-9}$ second can be attained with a beam voltage of 10 kv. Time differences of about 1/3 millimicrosecond can then be read off.

The iterative amplifiers now in use have a band width of 100 cps to 120 Mc, which permits the handling of rise times of 2.9 millimicroseconds. If the rise times of the cathode-ray tube are also considered, the resultant value is $3.4 \cdot 10^{-9}$ second. The rise time of the delay circuit can be neglected in the first approximation.

Materials

55. Some Work on Semiconductors Being Done at Ukrainian Institutes

"Automatic Control and Semiconductors," by Ye. Borisov; Moscow, Znaniye-Sila, Vol 34, No 8, Aug 59, pp 28-32

The great economic importance of semiconductors is emphasized in the Seven-Year Plan and reflected by it. A semiconductor industry is coming into being. During the past year, the production of semiconductors in the US increased by 80% and to a still greater extent in the USSR. The application of semiconductors in automatic control devices is of particular importance.

Work on semiconductor thermocouples is being conducted at the Institute of Powder Metallurgy, Cermets, and Special Alloys of the Academy of Sciences Ukrainian SSR (G. V. Samsonov, Deputy Director). This institute is located at Kiev. P. F. Kislyy, an engineer and scientific associate at the institute, demonstrated a thermocouple consisting of an outer tubular shell made of molybdenum silicide and a core of boron carbide located inside this shell. At one of the ends, the two components of the thermocouple are welded to each other, forming a rounded tip. At the other end, two wires are connected to the thermocouple, one to the molybdenum silicide tube and the other to the boron carbide core.

About 2 years ago, Academician A. F. Ioffe stated that the vary hard carbides, borides, nitrides, and silicides with high melting points have the properties of semiconductors. According to Ioffe, if the properties of compounds of this type can be controlled, new means will be available for the solution of technological problems involved in the employment of very high temperatures and high pressures. Research that is being conducted on the subject at the Institute of Powder Metallurgy, Cermets, and Special Alloys is carried out from this standpoint.

A thermocouple consisting of platinum and a platinum-rhodium alloy is suitable for measuring temperatures which do not exceed 1600°. The molybdenum silicide-boron carbide thermocouple developed at the Institute of Powder Metallurgy, Cermets, and Special Alloys can be used for temperatures up to 1800°. Furthermore, this couple develops a thermal electromotive force reaching 40 microvolts per degree, which is four times higher than the thermal EMF of the platinum/platinum-rhodium couple. Because of the high thermal EMF developed by the new thermocouple, its application makes it possible to make much more precise measurements. Furthermore, the new thermocouple has the advantages of low cost and simplicity of production by powder metallurgy methods from readily available materials.

The new thermocouple is being tested at the Alchevsk Metallurgical Plant for measuring the temperature of waste gases and of heated air in the vertical channel of an open-hearth furnace. Measurement of temperatures close to 1800° are involved in this application. The tests, which are being conducted with the active participation of the Institute of Automatics, Gosplan of the Ukrainian SSR, have already yielded positive results. The new thermocouple will also be applied at machine-building planst (for the measurement and automatic control of the temperature in heating furnaces), in the glass industry, and in the nonferrous metallurgy industry. Other applications are for the control of the temperature of the melt in electrolytic cells used for the production of aluminum and measurement of the temperature of liquid steel in open-hearth furnaces. When the thermocouple is used for the measurement of the temperature in aluminum electrolysis cells, it is protected by a sheath of silicon nitride. When protected by a sheath of titanium nitride, the thermocouple can be kept in liquid steel for 3 hours. This time must be doubled to attain a length of immersion corresponding to the period required for melting steel. At present, sheaths made of zirconium boride or titanium boride, to which molybdenum has been added, have been developed. When protected by a sheath of this type, the thermocouple can remain for 30 minutes in the molten iron of a blast furnace.

Still higher temperatures must be measured in connection with the industrial production of hard alloys. For this type of application, Ukrainian scientists have developed a semiconductor thermocouple which can be used at 2,000-2,300°. The outer tube for this thermocouple is made of titanium carbide and the core of boron carbide. This thermocouple has a thermal EMF of 45 microvolts per degree. Thermocouples of this type can be used only in a chemically inactive medium, such as vacuum, inert gases, or hydrogen. However, this does not constitute a difficulty because vacuum or a protective atmosphere must be used anyway in a furnace in which hard alloys are produced.

At the same institute, a thermocouple has been developed which consists of boron carbide and silicon carbide and which develop an unusually high thermal EMF, namely, up to 600 microvolts per degree. An appliance equipped with a thermocouple of this type is not an indicator or control instrument, but a transducer which transforms heat into electric energy. The thermogenerators being developed at Leningrad and Moscow under the direction of Academician A. F. Ioffe are low-temperature appliances in which the thermoelements are not heated higher than to 400-600°. At present, installations with a temperature ceiling of 1700° will become available for the work in question. This opens up extensive possibilities as far as generation of electric power by means of semiconductor appliances is concerned.

While ordinary thermistors stand heating to approximately 300°, thermistors newly developed at the institute can be heated to 1000° or even as high as 1300°. They are not affected by moisture, oxygen, or acids. Only hydrofluoric acid exerts an action on them, but not at temperatures below 1,300°. The thermistors in question are made of silicon nitride.

It is true that they cannot be used at room temperature. This applies to almost all the devices mentioned above and, quite generally, to all high-temperature semiconductors; they have the characteristics of insulators below 300-400°. However, this only means that different types of devices must be used in technology for different applications, thus supplementing each other. At the Institute of Powder Metallurgy, Cermets, and Special Alloys, work is also being done on silicon carbide radiodetectors and heating elements and resistances for high-temperature applications.

At the Physics Institute, Academy of Sciences Ukrainian SSR, work is being conducted on bolometers. Research on bolometers is conducted at a laboratory headed by D. Konozenko, which is located at Kiev (work on the subject is also being done at other cities of the USSR). Although one can make bolometers of metal, semiconductor bolometers consisting of metal oxides are particularly sensitive. Among applications which became possible with the use of bolometers, one may mention the development of ceramic radiators to be used for the heating of buildings (a suitable ceramic material could not have been developed without the use of bolometers), automatic control of the temperature of bearings of turbogenerators (thermistors can also be used for this purpose), automatic control of the temperature in connection with the production of ceramic products, and detection of intrared rays emitted by tanks, planes, automotive vehicles, and ships.

Work on photoconductors is also being done at the Physics Institute of the Ukrainian Academy of Sciences. One of the applications of photocells containing these photoconductors is in the automatic loading, switching, and unloading of lorries used for the transportation of coal in Donets Basin mines.

Single-crystal cadmium sulphide photoconductors were developed for the first time in the USSR by Ukrainian physicists G. A. Fedorus and A. I. Skopenko. Polycrystalline photoconductors of the same material were developed in Leningrad by B. T. Kolomiyes. The advantage of single-crystal devices is that their specific activity (i.e., the sensitivity per unit of crystal surface) is higher than that of polycrystalline devices.

The work on bolometers and photoconductors at the Division of Semiconductors of the Physics Institute, Ukrainian Academy of Sciences USSR, is being done under the direction of V. Ye. Lashkarev, Active Member of the Academy of Sciences Ukrainian SSR. In work done at this division, particular attention is being paid to photoelectric phenomena. By using the

same method applied for the production of cadmium sulfide, single crystals of cadmium selenide, cadmium telluride, and zinc sulfide are produced. These substances have different properties. By growing mixed single crystals from vapors consisting of more than one of the substances mentioned, semiconductors for photoresistances exhibiting definite pre-determined characteristics can be produced.

Physicists active at Kiev have also developed semiconductor photocells based on the use of silver sulfide. These photocells are 20 times more sensitive than selenium cells and 100 times more sensitive than vacuum photocells. Silver sulfide photocells are used for controlling the purity of the air in mines (the purer the air, the more transparent it is), for the control of production processes at chemical plants (by measuring the transparency of solutions), for optical measurements, etc.

The experimental production division attached to the Institute of Physics, Academy of Sciences Ukrainian SSR, produces thousands of photoconductors and photocells and scores of bolometers. However, production there is not on an industrial scale: it does not, by far, satisfy the demand for the products and devices in question. Although the Instiute of Powder Metallurgy, Cermets, and Special Alloys also has a production division, neither thermocouples nor any of the other devices mentioned are manufactured there. Mass production of resistances and heaters at industrial enterprises has already been organized. High-temperature thermocouples and thermoresistances, as yet, are not being produced anywhere.

At the 21st Congress of the CPSU, P. Ye. Shelest, Secretary of the Kiev Oblast' Party Committee, noted the successful work done by Ukrainian scientists in the field of semiconductors, making particular reference to the Institute of Physics and the Institute of Powder Metallurgy, Cermets, and Special Alloys. He also stated that it is necessary to create at Kiev an enterprise producing semiconductor devices.

56. Organization of USSR Work on Thermal Elements

"Organization of Work on Thermoelements" (unsigned item); Moscow, Vestnik Akademii Nauk SSSR, Vol 29, No 8, Aug 59, p 74

"Attaching particular attention to the organization of scientific research work on the development of thermoelements with a high efficiency, the Presidium of the Academy of Sciences USSR resolved to organize, at the Electrophysical Laboratory of the Institute of Metallurgy imeni A. A. Baykov, theoretical and experimental research on scientific and technical problems pertaining to thermoelectronic conversion and to the creation of thermoelectric devices which operate on the cascade principle and have a high efficiency."

57. Expansion of USSR Research on Semiconductors

"About the Expansion of Scientific Research Work on Semiconductors" (unsigned item); Moscow, Vestnik Akademii Nauk SSSR, Vol 29, No 8, Aug 1959, p 74

"As noted by the Presidium of the Academy of Sciences USSR, a review of the execution of a series of chemical, physico-chemical, and physical investigations in the field of semiconductors indicated that work has been successfully completed on a considerable number of subjects in this field. Investigation of a number of these subjects was concluded in 1958. At the same time, work must be expanded on the preparation and investigation of semiconductors having a complex composition, as well as work on crystal-chemical and structural properties of semiconductors.

"Concrete measures have been outlined which have the purpose of creating suitable conditons for the expansion of research on semiconductors at the institutes of the academy in such a manner that the accumulated experience will be utilized and reliable high-quality results assured as far as purification and synthesis of semicondutor materials, development of processes of semiconductor metallurgy, research on the surface properties of semiconductors, and research on other aspects of work in this field are concerned. A laboratory for the investigation of the structure of semiconductor alloys is being organized at the Institute of Metallurgy imeni A. A. Baykov.

"An expansion in 1959 of the staff of divisions and laboratories which conduct work on semiconductors has been recognized as necessary."

58. Expansion of USSR Work on Ferrites

"Development of Scientific Research on Ferrites" (unsigned item); Moscow, Vestnik Akademii Nauk SSSR, Vol 29, No 8, Aug 59, p 74

"The problem of ferrites is a cardinal one in the physics of the solid state. Research in this field is of particular interest from the scientific standpoint because phenomena observed on ferrites are on the borderline between the physics of semiconductors and the physics of magnetic phenomenon. For this reason, increased knowledge of the phenomena in question will contribute to our knowledge of the properties of matter. Without extensive application of ferrites, progress in some of the most important fields of technology (those of computers, radioelectronics, and electrical acoustics) and also in a number of fields of experimental physics (radioastronomy, radiospectroscopy, accelerators of elementary particles, etc.) will be impossible.

"As has been noted in a resolution passed by the Presidium of the Academy of Sciences USSR, progress has been made in the Soviet Union in research on ferrites, the production of ferrites, and the development of ferrite materials.

"The Presidium has outlined measures which are to be taken to further expand theoretical and experimental work on ferrites. The Laboratory of Ferrites and Seignettoelectrics of the Institute of Semiconductors has been charged with the investigation of a number of problems pertaining to the development and investigation of ferromagnetic semiconductor materials, as well as with the coordination of research in this field.

"The Institute of Metal Physics has been charged with theoretical research on ferromagnetic semiconductors and materials with a rectangular hysteresis loop and also with the experimental investigation of the properties of ferrites and materials with a rectangular hysteresis loop.

"Expansion of research on ferrites at other scientific research institutes is also foreseen."

59. Photocells With Deposited Alkali Metal Cathodes

"Data on Parameters and Technological Peculiarities of Photocells With a Cathode Made by Deposition of Several Alkali Metals," by T. A. Rabotnova and L. V. Kononchuk, Moscow Electric Bulb Plant; Moscow, Svetotekhnika, No 9 Sep 59, pp 1-7

In the Soviet Union, photocells with a cathode made by deposition of several alkali metals were developed for the first time by A. A. Mostovskiy, O. B. Vorob'yeva, and K. A. Mayskaya. Similar photocathodes were previously described by A. Sommer in the US. The photocells have an effective sensitivity up to 200 microamperes per lumen; maximum sensitivity is obtained in the range of 4,300 angstroms. Thermal current at room temperature is about 10^{-16}a per cm^2. The multialkali cathodes were prepared by deposition of the three alkali metals, sodium, potassium, and cesium, over a layer of antimony previously deposited on one side of a 38-mm diameter bulb. The anode, which also serves as an atomizer of antimony, is mounted at the center of the bulb.

The transverse resistance was measured for 23 photocells and was found to be of the order of 10^5 ohms per cm. The nonuniformity of sensitivity over the whole area of the cathode (20 x 30 cm) was found to vary not over 10%.

The results obtained in this experiment bring us to the conclusion that photocells with a multialkali cathode will find wide application in various fields of physics and engineering. Similarly, wide application will be in store for photoelectron multipliers with multialkali cathode and emitter.

60. Influence of Sintering Temperature on Ferrite Parameters

"On the Dependence of Physical Measurement Values on Sintering Temperature in the Case of Ferrites," by H. Hultschig, VEB WNB "Carl von Ossietzky," Teltow; Berlin, Nachrichtentechnik, No 9, Sep 59, pp 390-391

In the case of ferromagnetism, the theoretical interpretation of measurements is very difficult. It is not possible to compute, for ferrites, an n-dimensional surface for a particular property in relation to n-parameters nor can such a surface be determined on the basis of data given in the literature, since each author works on only that portion of such a surface which is most suitable and, in most cases, does not vary all the parameters.

Physical measurements are, therefore, necessary; many of them, however, involve considerable difficulty. The measurement of the specific resistance of ferrites is difficult because of the occurrence of boundary layers with rectification effect during contacting. The determination of porosity (volume, form, and distribution of pores) under the microscope can involve considerable error as a result of the enlargement of pores during polishing. In the case of Ni-Zn ferrites and sintering temperatures under 1,200°C no polished surface could be produced with a porosity value equal to that computed on the basis of density.

Experiments were conducted on the dependence of permeability, specific resistance, water density, mercury density, eddy current, and quality of polished surface on sintering temperature. All ohter parameters were kept as constant as possible. The results showed a stong increase of permeability, a strong decrease of specific resistance, and an improvement of polished surface quality with increasing sintering temperature.

[For additional information on materials, see Physics, Nuclear Physics.]

V. ENGINEERING

Automation, Control, Instruments, and Computers

61. Margin of Stability of Linear Automatic Control Systems

"On the Margin of Stability of Linear Automatic Control Systems," by V. F. Yarominek; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 8, 1959, pp 48-60

Linear automatic control systems should possess a sufficient margin of stability, which is rated according to the value of the Hurwitz determinant or the value of elements of the first column of the Routh algorithm. In this connection, it was found that the introduction of the notion of a uniform margin of stability is feasible both in the sense of the Hurwitz criterion and in the sense of the Routh algorithm.

A uniform margin of stability in the sense of the Hurwitz criterion and a uniform margin of stability in the sense of the Routh algorithm represent specific cases of the relationship between values of the determinants expressed by the law of geometric progression.

In the sense of the Hurwitz criterion and the Routh algorithm, intersecting points on curves of uniform margin of stability represent characteristic points of a normalized characteristic equation, as well as a point of a multiple radical whose coordinates, as in the case of the multiple radical, are determined by binomial coefficients.

Determinant diagrams are convenient for the investigation of margins of stability, since the region of stability on them coincides with the first quadrant. Thus, the necessity of locating the boundaries of stability is dispensed with. Furthermore, a uniform margin of stability in the sense of the Hurwitz criterion and in the sense of the Routh algorithm is represented on these curves in the form of two straight lines which intersect at an angle of 45 degrees and are invariant in relation to the coordinates of the axes for any degree of the characteristic equation.

62. New Measuring Instruments

"Work of Metrology Institutes and Laboratories," by P. P. Arapov; Moscow, Izmeritel'naya Tekhnika, No 8, Aug 59, pp 1-4

The following measuring instruments were displayed at the Exposition of Achievements of USSR National Economy.

The All-Union Scientific Research Institute of Metrology displayed the IPP-15 interferometer for checking flatness and parallelism with an accuracy of 0.05 micron and 0.1 micron, respectively. The instrument can perform measurements over a circular area 140 mm in diameter.

Photoelectric profiloscope FEP-1 is nintended for measurement of surface smoothness by the contact method. The range of measurement of the instrument is from the 4th to 13th class of surface smoothness according to GOST 2789-51.

The PCh-4 induction profilometer is intended for measuring the smoothness of metallic surfaces. The instrument has a diamond feeler needle. The measuring range is from 5th to 12th class of smoothness in accordance with GOST 2783-51.

The BV-890 device is intended for checking the pitch of gears, has a 4th degree of precision according to GOST 1643-56. The instrument is intended for measurement of pitch of large cylindrical gears.

The BV-1024 caliper is intended for internal diameters of small holes from 3 to 3.75 mm in diameter. The error of measurement does not exceed $\pm$0.01 mm.

The BV-1042 device is intended for continuous recording of measurements. The speed of tape travel is 200 mm per min.

The BV-1045 electric contact amplitude pick-up data unit for automatic control of deviation from desired geometrical forms is capable of making up to 5,000 measurements per shift. The error of measurement does not exceed $\pm$0.5 microns.

The BV-1010 induction recorder is intended for registering small displacements. The scale of recording in the vertical plane is 500 to 1, and in the horizontal, 5,000 to 1. The error of recording depends on the chosen scale and varies from $\pm$0.5 to $\pm$ 4 microns.

Frequency meter UCh-2 is able to measure in the range from 16 cycles to 26 Mc. The error for reproduction of frequency does not exceed $\pm$ 0.03%.

The AChF-3 is a pendulum astronomical clock in which the pendulum oscillations are maintained by the short pulses generated by a clock movement. The average diurnal variation is 0.0002-0.0003 sec.

An experimental first class piston type barometer has precision of measurement up to $\pm$0.002%.

The IKP-57 infrared pyrometer is intended for accurate measurement of temperatures in the interval between 400 and 1,100°C.

In the UBS-1 device for measuring high resistances from 10^9 to 10^{14} ohms, the error of measurement does not exceed $\pm 0.5\%$

The UIMM-2 device is intended for testing magnetically soft materials. The range of operating frequencies is from 20 kc to 1 Mc. The error in measuring magnetic permeability does not exceed $\pm 5\%$, inductance, $\pm 1\%$, and resistance, $\pm 5\%$. The range for measurement of inductance is from 100 microhenry to 50 millihenry.

In the UKIP-2 device for measuring hysteresis and eddy current losses in magnetic materials by the calorimetric method, the frequency range is from 20 kc to 1 Mc. The error of measurement is up to $\pm 5\%$.

The UBIYe-1 device is intended for measuring high inductance and capacitance. The operating frequencies are 50 and 100 cycles. The error for measurement of capacitance and inductance does not exceed $\pm 0.2\%$.

The UPPV device is used for measuring loss angle (tangent) of capacitors and time constant of large reactance-free resistors. The device is to measure the loss angle of capacitors from 10 micromicrofarads to one microfarad and the time constant of resistors from 500 ohms to 20 Mohms. The frequency range is from 40 to 20,000 cycles. The error in measurement of loss angle does not exceed $2 \cdot 10^{-5}$ radians, and of time constant, $2 \cdot 10^{-9}$ sec.

The MPM-1 millivoltmeter is intended for measurement of power transmitted through a wave guide. The range of measurement is from 15 to 80 milliwatts for voltage standing wave ratio not over 1.03 and from 50 to 800 milliwatts for voltage standing wave ratio not over 1.20. The error of measurement does not exceed $\pm 6\%$.

63. Direct Measurement of Luminescence in Test Wells

"Photoelectric Instrument for Investigating Luminescence of Test Well Walls," by B. Ya. Kudyumov and A. V. Ushakov, All-Union Scientific Research Institute of Geophysics; Moscow, Razvedka i Okhrana Nedr, No 7, Jul 59, pp 34-36

Changes in luminescence along walls of test wells, as related to increased oil saturation of drill mud or penetrated rock (also radioactive elements, dispersed and/or rare elements and minerals), may be measured directly with a photoelectric instrument designed by A. V. Ushakov.

Instrument consists of a lensed opening ((illuminator)), ultraviolet ray tube, prism, filter, FEU-13 photomultiplier, preamplifier stage, discriminator, multivibrator, and high-voltage generator, arranged respectively in a steel cylinder 90 mm in diameter and 150 cm in length. Light produced by ultraviolet irradiation of well walls passes through the lensed opening, prism, and filter onto the photomultiplier. Impulses of current produced at the photomultiplier anode pass through the other instrument elements indicated. Resulting impulses pass along a cable to the counter or integrating device of a standard surface-based radioactive log.

An integrating cell proved more suitable in test logs due to the number of impulses received. Registration of continuous curves of luminescence of a well with the same recurrence of readings was possible at speeds up to 1,200 m/hr. The instrument is considered to hold promise for application in industrial geophysics, particularly in the study of oil-bearing and high-salt reserves, where electric logging methods are ineffective.

Use of Computers in Design of Steam Boilers

"Thermal Design of Steam Boiler Assembly With Aid of the 'Ural' Computer," by M. P. Simoyn, F. A. Val'man, and S. A. Stavtseva, Central Scientific Research Institute for Complex Automation; Moscow, Teploenergetika, No 9, Sep 59, pp 32-39

The procedure for boiler thermal design is a time-consuming operation if conducted in conventional manner. To speed-up calculations, the "Ural" computer was used for this purpose at the Central Scientific Research Institute for Complex Automation. The algorithm ((a definite sequence of operations leading to the solution of problem)) and the program for thermal calculation of the computer were worked out.

The computer is capable of carrying out arithmetic operations and a series of logical operations at a rate of 100 operations per second. The intermediate results and instructions are stored in the internal memory unit of the machine, which is in the form of a magnetic drum. The capacity of the internal memory is 1,024 nine-digit decimal numbers or 2,048 instructions. The computer has also an outer memory on magnetic tape (capacity 40,000 numbers) and on perforated tape ((10,000 numbers)). The computer has a fixed decimal point and thus can operate with numbers less than unity.

From the mathematical standpoint, this method is merely a solution of a complex system of nonlinear algebraic equations by means of successive approximations. The tabular data for the condition of steam, water, gas, and air are replaced by analytical expressions because the internal memory of the "Ural" has only a small storage capacity. The use of equations has permitted reducing the burden on the memory unit of the computer by eliminating a large volume of tabular data, while retaining a high degree of precision. Other tabular data were also represented approximately by polynomial type equations. Generally, only 30 min are required to carry out the whole process of thermal calculations.

The computation process can be further speeded up to only 3-5 min, if the internal memory of the computer is increased to 10,000 numbers.

65. Single Combined Analog-Digital Principle for Computer Design

"On One Possible Principle of Constructing Mathematical Machines," by G. Ye. Pukhov; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 8, 1959, pp 3-11

As is well known, currently used computers are divided into two general classes: continuous-action (analog) computers and discrete-action (digital) computers.

The solution of various problems on digital computers is done by means of a sequence of elementary operations, the number of which depends on the design of the machine. Generally, these are addition, subtraction, multiplication, division (logical operations of comparing two numbers), and several auxiliary operations necessary for guaranteeing the automatic operation of the machine.

This article shows that, for the production of a universal computer, only one "elementary" operation needs to be performed, namely, the calculation of any component of two participating multidimensional vectors, assuming that they are orthogonal. Although such a machine may be designed to operate on purely digital elements, this article considers, for the sake of simplicity, a principle of design and operation which is applicable to the case in which the indicated basic operation will be carried out by continuous-action (analog) devices, particularly those controlled by voltage and current dividers consisting of ohmic resistances. Inasmuch as the numbers introduced into the machine in this case will be depicted by continuous values and known and unknown functions will both be given and obtained in discrete form (for individual points), such a machine may be called a mathematical machine of continuous-discrete (analog-digital) action.

66. Cybernetics in Rolling Mill Production

"Cybernetics in Rolling Mill Production" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 4 Sep 59, p 1

The Institute of Automation of Gosplan, Ukrainian SSR, together with the Computer Center of the Academy of Sciences, Ukrainian SSR, and the Dnepropetrovsk Metallurgical Institute, developed the first cybernetic system for rolling mill production. This system, with the application of controlling computers, automatizes the heating of soaking pits in which the steel ingots are preheated before the rolling mill.

The original pickups, devised by V. Kostogryzov, candidate of technical sciences, permit the determination, not only of the temperature of the heated ingots, but also of the degree of its heating in the entire width of metal.

The first four cybernetic regulators and pickups were installed during the present year at the plant "Zaporozhstal'."

67. Processes of Filtration Performed Automatically

"Filtration Done Automatically" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 21 Aug 59, p 2

Scientists and engineers of the Ukrainian Scientific-Research Institute of Chemical Machine Building designed and constructed a device in which all the processes of filtration -- from introduction of suspended matter to discharge of sediment -- proceed automatically. This press is 6-8 times more productive than manual filtration and yields sediment with a minimum moisture content, sharply improving the quality of production and reducing expenditure on filter element.

Experimental models of this device, according to the plans of the institute, are put out by the Berdichev plant "Progress." In the coming year, series production of automatic filter presses will be undertaken for various branches of industry.

[For additional information on automation, see also under Chemistry, Radiochemistry.]

68. Voltage Regulation of Very Long Power Lines

"Possibility of Voltage Regulation at the Intermediate Points of a Half-Wave Line," by S. P. Khatskevich, Novosibirsk Electrical Engineering Institute; Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika, No 7, Jul 59, pp 11-14

The extensive power resources in Siberia and the construction of large electric stations, on one hand, and the deficiency of electric power in the Urals, on the other hand, have necessitated the transmission of electric power over great distances of an order of 2,500-3,000 km. The proposed creation of the Unified Power System of the USSR will also require the use of very long power lines.

Tuned electric power lines for such great distances might be more advantageous than ac power lines corrected for power factor by capacitors or dc power lines.

At the Electric Power Systems Laboratory of the Siberian Branch, Academy of Sciences USSR, under the direction of Professor Shcherbakov, the behavior of tuned power lines was studied for a number of years, but some of the phenomena are still not well understood. The problem of power tapping at intermediate points of a tuned transmission line without disturbing the whole line has not yet been fully solved. Such power tapping at intermediate points causes voltage fluctuations in the whole line, according to the law of hyperbolic function, when the load of the line is changing.

Experiments were conducted on voltage regulation at intermediate points of a half-wave line by changing the reactive load at the end of the line or by introducing reactance in the middle of the line. This research has revealed that, in a half-wave line, it is possible to maintain steady voltage at two intermediate points by introducing reactance in the middle of the line.

69. New Method of Frequency Conversion

"Frequency Conversion With the Aid of Two Induction Commutatorless Machines," by N. A. Gol'tsev; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy Energetika, No 7, Aug 59, pp 41-44

This study was concerned with a new method of frequency conversion with the aid of two commutatorless induction machines, coupled in tandem on a common shaft. By manipulating a system of reversible switches, a number of resultant frequencies were obtained.

A table is included in the article which provides formulas for determination of line frequency and for calculation of the speed of rotation of induction machines of the converter stage for various switching arrangements.

At the Electromechanical Laboratory of the Power Engineering Institute imeni G. M. Krzhizhanovskiy, Academy of Sciences USSR, the speed control of a high-speed induction motor with the aid of variable frequency current was studied. The frequency converter used in this experiment consisted of two stock induction machines coupled in tandem on a common shaft. Seven steps of speed were obtained within a range of one to 9.5.

70. Replacement of Copper by Aluminum in Electric Machinery

"Stepping-up Engineering Progress in the Electrical Industry" (unsigned article); Moscow, Vestnik Elektropromyshlennosti, No 8, Aug 59, pp 1-3

The article contains the following passages:

"The electrical engineering industry is one of the principal consumers of nonferrous metals; therefore, it is necessary to make all possible efforts to save as much as possible of such metals, particularly copper. Copper should be replaced by aluminum in all electrical devices where the use of copper is not absolutely essential.

"A great deal of work should be performed by the various plants of the cable industry in replacing a great variety of copper cables by aluminum cables.

"The workers of transformer plants are confronted with no less a problem in substituting aluminum for copper in transformers up to 1,000 kw.

"The experiment on substituting aluminum wiring for copper in first and second class (with respect to capacity) transformers, conducted at the Armelektrozavod plant, has shown that the realization of this important measure requires a considerable increase in production of cold-rolled transformer steel. It is a matter of honor among the ferrous metallurgy workers to assure delivery of the needed transformer steel in the shortest possible time by the electrical engineering industry."

71. Testing Electrical Equipment for Use in Tropical Countries

"Basis for Selection of Moisture-Resistance Tests for Equipment To Be Used Under Tropical Conditions," by V. A. Bayev, V. V. Maslov, and M. L. Orzhakhovskiy; Moscow, Vestnik Elektropromyshlennosti, No 9, Sep 59, pp 72-77

The electric equipment intended for shipment to countries with a tropical climate must be tested under conditions similar to those actually existing in that particular locality. Special attention should be given to the selection of proper moisture-resistance testing methods.

After an extensive discussion of various testing methods, the author concludes that the following conditions should be observed: the duration of a moisture-resistance test under conditions of 98% relative humidity and 40°C should be 21 days, and at 55°C, only 7 days. The test should not be continuous, but should be cyclic. Duration of the cycle should be 24 hours, of which 16 hours are used in subjecting the equipment to the damp atmosphere and the other 8 hours to cooling to 5°C. Testing under the above conditions is equivalent to storage for a period of 1-1.5 years under conditions prevailing in the tropics.

Miscellaneous

72. A Report on the Hungarian Mining Research Institute

"The Isotope Lamp Will Burn 10 Years on One Filling -- Latest Achievements of the 10-Year-Old Mining Research Institute," by Istvan Vig; Budapest, Magyar Nemzet, 25 Aug 59, p 3

In the fall of 1958, a new group of buildings rose on the side of the Matyashegy (Matyas Mountain) in Obuda. The Mining Research Institute has moved into these buildings. Methodical research was begun just 10 years ago by 25 workers in the Mining Research Laboratory. Today, 300 persons work in the institute, which deals with all kinds of mining except petroleum.

Zoltan Ajtay, Kossuth Prize winning mining engineer and candidate of technical sciences, has headed the institute as director for 4 years.

There are 12 departments working in the Mining Research Institute, and they have achieved significant results. The program of the coal preparation department included expansion of the mining of coking coals. The coking coal output of the Pecs and Komlo mines has doubled in 10 years.

A loading machine with a pneumatic motor has been designed in the institute under the guidance of its inventor, Istvan Hidasi, Kossuth Prize winning director of the Central Trans-Danubian Coal Mining Trust, Plans for a Sebo type loader and a Buda type loader are being prepared for the bauxite mines.

A locomotive radio was built for the Rudabanya plant; this permits the dispatcher to keep in contact with the engineer. A coal cutter which was designed here will soon be put into operation in the Pecs and Komlo mines.

The institute was very successful with the F-4 and F-5 coal-cutting machines. Recently, a Hindu delegation went to Oroszlany to see the F-5. The F-4 preceded the F-5; the latter travels on a caterpillar tread. At present, 23 of the F-4 and F-5 machines are working in our mines.

The institute is now being provided with an isotope laboratory. This laboratory will also serve the oil industry. They are working on isotope signaling and lighting equipment in the institute. The isotope lamp will burn 10 years on one filling, and it will have no cables or wires. They are now making preparations for experimental work; half of the equipment [for the isotope laboratory?] is already in the warehouse awaiting installation.

The institute had 160 research projects in 1958; in addition to these, trusts and enterprises submitted 145 jobs for processing. Among other things, they determined the combustible content of the materials remaining in the waste mines [probably the spoil heaps at the mines] in the Pecs, Komlo, Dorog, Central Trans-Danubian, Nograd, and Borsod fields, and they prepared an indicator for use on these wastes to show how much of the material could be used as fuel.

Laszlo Erdelyi did research on agricultural use of powdered lignite; 10 percent of the powdered lignite from the mines could be used for soil improvement [if this method of soil improvement spread to all suitable areas in Hungary].

Nearly 100 guest specialists visited the institute in 1958, spending about 500 days in the various departments.

VI. MATHEMATICS

73. Asymptotic Differentiability of Functions of Two Real Variables

"Concerning the Asymptotic Differentiability of Functions of Two Real Variables," by F. I. Smidov; Moscow, Uspekhi Matematicheskikh Nauk, Vol 14, No 4 (88), Jul/Aug 59, pp 213-216

The necessary and sufficient conditions for the existence of an asymptotic total differential for a measurable and almost everywhere finite function of two real variables on a bounded, planar set are established.

74. Cellular Matrices Employed in Investigation of Corpuscular Systems

"Concerning the Application of Cellular Matrices in the Mechanics of Corpuscular Systems," by P. Rozha; Moscow, Uspekhi Matematicheskikh Nauk, Vol 14, No 4 (88), Jul/Aug 59, pp 207-211

It is known that the theory of matrices is extremely convenient for the study of systems of linear differential equations. In the present work, it was indicated that a cellular form of the coefficient matrices arising during the investigation of oscillations of two-dimensional corpuscular systems has properties encompassing these investigations. Constrained oscillations of a rectangular corpuscular membrane were investigated, and a theorem was proved which is a two-dimensional generalization of a phenomenon investigated by Routh.

75. Functions Regular in n-Connected Circular Regions Studied

"On Two Classes of Functions Regular in n-Connected Circular Regions," by L. Ye. Dunduchenko and S. A. Kas'yanyuk, Zaporozh'ye Machine Building Institute; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 5, Sep/Oct 59, pp 468-472

The authors present and investigate two very general classes of functions, $\beta_0 (K_n)$ and $\beta_* (K_n)$, regular in n-connected circular regions, between which there exists a relationship of the Alexander type. The structural formulae of these classes are determined, and a number of exact estimates are obtained. Concretization of the parameters of these classes makes it possible to select from them most classes of functions which are n-connected analogues of the respective classes of functions, adequately studied in the circle and anulus.

VII. MEDICINE

Aviation Medicine

76. Loss of Consciousness at High Altitudes

"Causes, Mechanisms, and Prevention of the Loss of Consciousness at High Altitude," by Col Med Serv V. A. Skrypin; Moscow, Voyenno-Meditsinskiy Zhurnal, No 6, Jun 59, pp 27-32

The author of this article states that sudden loss of consciousness at high altitudes is caused by a sharp decrease in the cerebral blood flow and is ordinarily preceded by weakness and the sudden advent of a feeling of indisposition, unpleasant sensations such as intense vertigo, a heavy feeling in the head, nausea, and vomiting. Forerunners of loss of consciousness at high altitudes are confusion, lethargy, a marked increase in the respiration rate, convulsive twitching of the fingers or of the entire hand, trembling of the body giving way to a general convulsive state, and either a weak and rapid pulse (up to 150 or more beats per minute) or slowing down of the pulse rate to 40-50 beats per minute. This is usually accompanied by pronounced autonomic symptoms such as paleness and profuse cold sweat. Hypoxia appears quite suddenly since self-control at its onset is usually absent. The tendency to doze may be considered a symptom of the approaching loss of consciousness.

Loss of consciousness at high altitude is caused mainly by the absence of sufficient oxygen in the inspired air (hypoxemia). The negative effect of rarefied atmosphere on the human organism may be manifested in the form of decompressive disturbances. Other, nonspecific causes for loss of consciousness are inertial forces. Cerebral anemia results from the flow of the blood away from the brain due to the action of inertial forces.

Loss of consciousness at high altitude, caused by hypoxemia, consists of a disturbance in the function of the autonomic nervous system. Functional disturbances take place in various systems of the organism, primarily the respiratory and circulatory systems. If hypoxemia is not severe and the compensatory reactions of the organism are sufficient to reduce the negative effect of oxygen deficiency, there is no loss of consciousness at high altitude. If hypoxemia is severe, disturbances in the function of the central nervous system become so great that the function of the cardiovascular and respiratory systems becomes greatly disrupted.

Results of 119 experiments on 33 people revealed that, without an oxygen supply, loss of consciousness at an altitude of 7,000 meters occurs within 5.5 minutes; at an altitude of 8,000 meters, within 2.5 minutes; at an altitude of 9,000 meters, within 1.5 minutes; and at an altitude of 10,000-12,000 meters, within 25-40 seconds.

To prevent possible loss of consciousness at high altitude, oxygen must be added to inspired air at an altitude of 4,000 meters. At an altitude of 10,000 meters, it is necessary to revert to breathing pure oxygen. This eliminates or considerably reduces the extent of hypoxemia and ensures protection against loss of consciousness at high altitudes.

Flights at high altitude are now made in airplanes equipped with hermetic cabins. Air pressure higher than that of the surrounding atmosphere is maintained in the hermetic cabins. Air crews are provided with devices which supply oxygen under pressure to the respiratory tract in case the cabin is dehermetized. Air crews are also provided with high-altitude survival suits.

Loss of consciousness at high altitude occurs not only as a result of hypoxemia, but is also due to hypocapnia (a deficiency of free carbon dioxide in the blood). Oxygen deficiency in the blood results in the irritation of chemoreceptors in the vascular reflexogenic zones (mainly the sino-carotid and aortal) and produces stimulation of the respiratory center, causing hyperventilation of the lungs and consequently significant loss of carbon dioxide. Hypocapnia, therefore, aggravates the effect of hypoxemia and contributes to more rapid loss of consciousness.

Air crews must understand the mechanical characteristics of their organism and must be familiar with the functioning of the human body under conditions existing at high altitudes. The extent to which the limiting factors of the human body are compensated by available equipment must be understood well. Carelessness and lack of knowledge and understanding can make efficient equipment valueless.

77. Atelectasis After High-Altitude Flight

"Atelectasis of the Lung in the Human After Breathing Oxygen Under Increased Pressure at High Altitudes," by Col Med Serv P. N. Ivanov; Moscow, Voyenno-Meditsinskiy Zhurnal, No 6, Jun 59, pp 37-38

The author of this article states that clinical examination of individuals immediately after they had finished an experimental flight to high altitude revealed that symptoms of atelectasis were present in some persons

who had worn compensating garments and had inspired oxygen under increased pressure. Dark spots noted in the vicinity of the chest organs seem to depend neither on how rarefied the atmosphere was in the altitude chamber, nor on the period of time each subject remained at high altitude. Atelectasis developed in some people who were unable to endure the conditions experienced at high altitude and were forced to make a rapid descent to lower altitudes. In some people, atelectasis appeared after the first experiment or after a subsequent experiment; in others, atelectasis appeared after almost every experiment. It is impossible, therefore, to establish any connection between flights to high altitude and the manifestation of atelectasis.

Inasmuch as atelectasis symptoms were observed after the experimental flight to high altitude, in which the subject wore an altitude compensating garment was completed, it can be concluded that external compression on the chest organs is the cause of their manifestation. This compression at high altitude, when oxygen is inspired under pressure, is due both to the action of the compensating garment on the chest and to the distention of the diaphragm produced by expanding gases in the gastrointestinal tract; the respiratory function of the diaphragm is weakened, which contributes to the genesis of atelectasis. Respiration during increased pulmonary pressure, connected with the need for an oxygen supply to the organism at high altitude, in itself precludes the possibility of the development of atelectasis. The author states that this apparent contradiction forces him to think that atelectasis manifests itself only at the time of recompression, when the pressure in the lungs reaches the same level as that of the surrounding atmosphere: irregular ventilation of the lungs is created as the result of continued pressure on the chest by the compensating garment.

78. Excess Oxygen Pressure Studied

"An Effective Norm for Excess Oxygen Pressure in a Mask at High Altitudes," by Lt Col Med Serv, S. G. Zharov; Moscow, Voyenno-Meditsinskiy Zhurnal, No 6, Jun 59, pp 33-36

The author of this article states that results of experiments with 12 healthy men in an altitude chamber under smooth ascent conditions (a rate of 20-40 meters per second) and at the atmospheric pressure encountered at altitudes of 16-18 kilometers showed that the compensating properties of high altitude survival suits are relatively satisfactory. On the basis of the data obtained, it was concluded that the most satisfactory condition at altitudes of 16-18 kilometers existed when inspired oxygen was supplied under a total pressure of 130 millimeters in the mask. The over-all

condition of the subjects remained satisfactory after they were exposed for 10 minutes to changes in atmospheric pressure found at altitudes of 16-18 kilometers. Repeated exposure to a drop in atmospheric pressure resulted in less pronounced changes in the physiological functions of the organism. This indicates that protective adaptive mechanisms can be developed in the human organism.

The author of this article states that his experiments were based on information found in the literature (M. I. Vakar, D. I. Ivanov, Barach, Fenn, Ferris, and others). It is known, from the literature, that compensating reactions of the human organism, during respiration under absolute pressure, consist mainly of an increase in the frequency of cardiac contractions, a rise in vascular tonus, an increase in venous and arterial blood pressure, and the development of new, coordinating relationships in the regulation of respiration. The altitude survival suit performs a protective function because it creates counterpressure on the body, prevents dilation of the lungs, and reduces obstruction in blood flow in the peripheral vessels, thereby aiding in the development of compensating reactions by the organism. Such a garment obstructs the flyer's movements and is detrimental to body hygiene. In connection with this, it is necessary to find a compensating garment that can be used in any kind of flight, and provide counterpressure on the human body, better comfort, mobility, and hygienic conditions within the space between the body and the garment.

79. Chinese Research in Aviation Medicine

"Military Aviation Medicine Expands Rapidly" (unsigned article); Peiping, Chien-k'ang Pao, 1 Aug 59, p 2

This article describes briefly the growth of aviation medicine in China since the advent of the Communist regime. Besides mentioning various medical services provided for air force personnel, the article gives the following information.

The Air Force Party Committee has set up an experimental laboratory with a low pressure chamber and a Research Institute of Aviation Medicine (航空医學研究所). Much literature on modern aviation medicine has been translated and published. A large group of doctors in military aviation medicine have been trained in special training classes operated on a continuous basis. Research in aviation physiology is being conducted in aviation schools which have established departments specializing in the subject. Some cadres have been trained. To date, several hundred reports of research on and experience in aviation medicine have been accumulated.

Bacteriology

80. Method of Determining Live and Dead Bacterial Cells

"The Microrefractometric Method for Direct Determination of Live and Dead Bacterial Cells," by B. A. Fikhman, State Control Institute of Medical and Biological Preparations imeni Tarasevich; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 8 Aug 59, pp 100-103

This article reports special experiments performed by the author to determine the optimum conditions for detecting differences in light refraction between live and dead bacterial cells. The experiments showed that the maximum optical differentiation between live and dead cells is attained when immersion media with a light refraction index which is equal to or only slightly greater than the light refraction index of live cell protoplasm is used. After testing different immersion media, clear purified gelatin gel prepared in distilled water was found to be best. Its advantages are listed.

Isolated calls of the following microorganisms were studied: B. coli, Flexner and Sonne dysentery, S. typhi, paratyphi A and B, B. pestis EV-76, Staph. aureus, B. proteus vulgaris, S. prodigiosum, and B. mycoides and megatherium. Suspensions of these organisms, prepared from one-day cultures grown on liquid and solid culture media, were killed by high temperature, 0.5% phenol, merthiolate, absolute alcohol, numerous freezings and thawings, and prolonged shuttling with beads. Preparations for microscopic examination were made from these suspensions and from suspensions of the live organisms not subjected to the effects enumerated.

The preparations were examined in the immersion system of an MFA-2 anoptral microscope, which is an improved negative phase-contrast apparatus which makes it possible to distinguish smaller differences in optical density than those which can be perceived by ordinary phase contrast. The advantages of the MFA-2 permit its use as a highly sensitive refractometer capable of detecting changes in light refraction indexes lower than 0.001.

The following conclusions are offered:

"1. A new method for direct microscopic differentiation of live from dead bacterial cells was developed.

"2. The method was based on the principle of immersion microrefractometry of bacterial cells. Gelatin gels with definite concentrations (gelatin series) were employed as immersion media. An anoptral microscope was used as a microrefractometer.

"3. The objectivity and availability of the method make it suitable for extensive practical use."

The author mentions that the determination of the relationship between live and dead cells by this method is very important in investigating live vaccines and dry bacterial cultures, and in studying the effects of different drying systems on the viability of microorganisms.

81. Chinese Study Shigella Alkalescens-Dispar in Dysentery

"A Group of Alkalescens-Dispar Isolated From Cases of Dysentery," by Shu Chun (舒淳), Serum Laboratory, Serum and Vaccine Institute of the Ministry of Health; Peiping, Jen-min Pao-chien (People's Health), Vol 1, No 8, Aug 59, pp 599-604

This article reports the details of cultural, biological, and serological studies on 54 strains of bacteria which were isolated from hospitalized dysentery patients by an unspecified dysentery-control agency and sent to the author's institute for typing. They were identified as belonging to the O-2 Group of Shigella alkalescens-dispar. However, since their hemolytic and necrotizing abilities were much stronger than the alkalescens-dispar described by Nishi and Hiroki, and by Frantsen, they were provisionally designated as the "Wei-fang Variant (濰坊变种) of the O-2 Group of Shigella alkalescens-dispar."

Subconjunctival inoculation of day-old broth cultures of the alkalescens-dispar strains produced no reaction in guinea pigs, whereas other dysentery bacilli induced granular, purulent conjunctival reactions in control animals. All 54 strains produced varying degrees of necrosis in experimental rabbits inoculated intracutaneously and 53 strains hemolyzed rabbit erythrocytes in day-old peptone water cultures. Two strains were negative with respect to the presence of surface K antigens. The other 52 strains had identical K antigens and all strains had identical O antigens.

Complete records were available on only 25 of the 36 dysentery patients from whom the Shigella alkalescens-dispar used in this study were recovered. The records showed that 20 of them were negative with respect to infection by any other dysentery bacillus. However, sigmoidoscopic examination revealed morbid changes in all 20. Eighteen had abdominal pain or tenesmus; 15 had stools with pus, blood, and mucous. The majority of cases were chronic.

The reported percentage ratio of Shigella alkalescens-dispar to other dysentery bacilli recovered from hospitalized dysentery cases in a single community during the period April-October 1957 was 38.6:63.2.

Epidemiology

32. Interseasonal Preservation of Plague Pathogen

"The Role of Marmots in the Preservation of Plague Infection During the Interepizootic Season," by N. I. Makarov and Ye. P. Makarova, Izv. Irkutskogo N.-I. Protivochumn. In-ta Sibiri i Dal'n. Vost. (News of the Irkutsk Scientific Research Anti-plague Institute of Siberia and the Far North), No 15, 1957, pp 83-87 (from Referativnyy Zhurnal — Geografiya, No 4, Apr 59, Abstract No 10852)

"Subcutaneous infection of "tyan"-shan"skiy" marmots with a minimum lethal dose (5,000 microbial bodies) caused the death of all the animals infected in April and June, 40% of the animals infected in August, and 20% of those infected in September. The 13 marmots which survived went into hibernation in November and awakened in March. On examination of five hibernating marmots, pathological-anatomical changes and characteristic plague were noted, and a virulent culture of P. pestis was isolated. Marmots carrying the infection in the autumn were found, after awakening, to be susceptible to new plague infection. All eight marmots which were infected within 1 1/2 months after awakening died of plague."

33. Ornithosis in Humans

"Two Cases of Ornithosis in the Human," by I. Belopyev and B. Lografskiy; Sofia, S'vrem. Med., Vol 8, No 9 pp 67-74 (from Referativnyy Zhurnal — Geografiya, No 5, May 59, Abstract No 14260)

"In Bulgaria, ornithosis in domestic birds was first observed by Ermidzhiyev. The average infectivity of pigeons on two farms near Sofia was 20.84%; in Ruse, 21.61% and in Radomir, 22.5%; the titers of serological reactions reached 1:32-1:16,384. Two cases of ornithosis in humans, the first in Bulgaria, are reported. (in Sofia and a rural area near Radomir). In one case the patient had been in contact with pigeons and in the other, with chickens."

84. Geographic Distribution of Rickettsioses

"The Problem of the Geographic Distribution of Rickettsioses," by V. A. Kraminskiy, Sb. Nauchn. Tr. Voyen.-Med. Fak. pri Saratovsk. Med. In-te (Collection of Scientific Works of the Military Medical Faculty, Saratov Medical Institute); No 1, 1957, pp 130-142 (from Referativnyy Zhurnal -- Geografiya, No 5, May 59, Abstract No 14177)

"In addition to epidemic (historical) typhus there are foci of endemic (murine) typhus, usually called Manchurian, and tsutsugamushi fever in Korea. Manchurian typhus is endemic in Korean cities, especially in P'yongan-namdo south of the 40th parallel. The limits of its distribution correspond with the distribution area of the Xenopsylla cheopis flea, which is the principal carrier of the pathogen. The reservoir of infection is the brown rat. The rarity of Manchurian typhus at the seashore, where the brown rat is widely distributed, is probably connected with the fact that Xenopsylla cheopis is absent there. The epidemic season for Manchurian typhus is September-December, with the maximum incidence in October and November. The majority of those who contract the disease are newcomers; the local population rarely becomes ill, since it is immune to Manchurian typhus; this immunity does not protect it from historical typhus. The clinical picture of the disease and prophylactic measures are described. Tsutsugamushi fever is encountered in Korea in rural areas."

85. Chinese Discover Tick Vector of Tsutsugamushi Fever

"Discovery of Adult Tick (Ixodes sp.) Naturally Infected With Rickettsia Tsutsugamushi," by Juan Kuang-lieh (阮光烈), I Ying-nan (易應南), Kao Ling-i (高令儀), Fukien Medical College; Lin Chin-jui (林金瑞), Yu En-shu (于恩庶), Fukien Institute of Epidemiology' and Cheng Pi-te (鄭彼德), Fuchow Army Health and Epidemic Control Station; Peiping, Jen-min Pao-chien (People's Health), Vol 1, No 8, Aug 59, pp 730-732

This item reports the "unprecedented" discovery of an adult tick (Ixodes sp.) which is a natural transmitter of tsutsugamushi fever. The tsutsugamushi rickettsia isolated from this species of tick was named the Fukien Tick Strain (閩蜱株). Results of studies concerning its general characteristic, pathogenicity to small animals and monkeys, serologic and immunologic reactions, etc. are presented.

This paper was received for publication on 19 May 1959.

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86. Summary of Book on Blood Substitutes

Iskusstvennyye Zameniteli Krovi (Artificial Blood Substitutes), by I. L. Chertkov; Moscow, Medgiz, 1958, 116 pp

The book consists of an introductory chapter, three textual chapters, an extensive bibliography, and a table of contents. In the introductory chapter, the author defines and classifies blood substitutes. He prefers the use of the term "plasma substitutes" over "blood substitutes," for as yet no satisfactory substitute for whole blood has been found. In the three textual chapters, the author lists and briefly describes the different plasma substitutes.

Chapter 1 of the book is entitled "Plasma Substitutes of Complex Action," and lists the following plasma substitutes.

Nonprocessed bovine blood serum -- impractical for use because of its anaphylactogenic properties.

Albumin of bovine blood serum -- also unusable because of its high toxicity and tendency to induce anaphylactic reaction in the patients.

Serum proteins denatured by formaldehyde and heat -- usable and being used as a plasma substitute.

Nonspecific bovine serum (Edward's serum) -- unsatisfactory because of its anaphylactogenic properties and low colloidal-osmotic pressure.

Annis's serum -- its anaphylactogenic properties and low colloidal-osmotic pressure make it impractical for use.

Plasmonal -- developed in Japan and prepared from the blood of hogs, cattle, buffaloes, and horses and found to be a satisfactory plasma substitute in experiments on animals; the methods and technique of preparing plasmonal have not yet been published.

Isoplasm -- developed in Spain and prepared from citrated bovine plasma. It is being used only in Spain at present.

Hemoplasm -- developed in France by processing citrated bovine serum with formaldehyde and heat. Hemoplasm is not widely used because of the danger of an anaphylaxis reaction.

Adequan -- a plasma substitute developed in West Germany from bovine serum. Favorable clinical results in the application of adequan are reported.

Neutroserum -- developed in Switzerland from horse serum. It is Anaphylactogenic and has low colloidal-osmotic pressure. The author does not recommend its use.

Anaplasm -- developed in Italy from the blood of horses. Its properties are similar to those of hemoplasm.

Naprin -- developed in the USSR by I. F. Leont'yev and a group of coworkers. By a special process, they obtained nonantigenic proteins such as globulin from chestnuts, glycine from soya, myosin from invertebrates, and casein from milk. In experiments carried out on animals, naprin failed to produce anaphylactic reactions.

Sterilized serum -- proposed as a plasma substitute by A. N. Filatov and L. G. Bogomolva in 1941-1942. It is prepared by the thermal processing of proteins and the addition of one volume of 3-percent solution of sodium bicarbonate and three volumes of 4-percent solution of glucose to one volume of the serum. The plasma substitute is not widely used because of its low protein content.

Colloidal infusion -- it was proposed as a plasma substitute in 1942 by M. A. Lisitsin, N. A. Fedorov, and P. S. Vasil'yev. The initial material from which the plasma is prepared is casein. The composition of colloidal infusion is as follows: sodium chloride, 7.5 grams; magnesium chloride, 0.1 gram; potassium chloride, 0.2 gram; sodium bicarbonate, 2.8 grams; nonanaphylactogenic casein, 40.2 grams; and distilled water, one liter. The preparation has a viscosity of 2.4, and its pH is 7.3-7.8. It can be boiled for a considerable period of time, and can even be sterilized in an autoclave at an atmospheric pressure of 1.5. The first 2,000 transfusions made with the plasma have established its therapeutic effectiveness. Its production, however, was discontinued because of technical difficulties, and no further evaluation of the value of the plasma was made.

Belen'kiiy Therapeutic Serum -- developed in the USSR and obtained from posthemorrhagic blood serum of cattle and is similar to nonspecific bovine serum. Its use had to be restricted because of its tendency to induce anaphylactic shock.

BK-8 -- a plasma substitute prepared from bovine blood serum by a group of Soviet scientists. The serum is hydrolyzed with a solution of HCl at a temperature of 37 degrees, and the proteins are precipitated,

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dissolved, and treated with formaldehyde and heat. The plasma has a specific weight of 1,020-1,023, a relative viscosity of 1.4-1.6, and its pH is 7.4-7.8. While the laboratory preparations of the plasma have been found to be beneficial, the factory-produced preparations have been found to possess toxic and pyrogenic properties.

L-120 -- a plasma substitute developed by L. G. Bogomolova from bovine serum. No evaluation of the preparation can be made until it is clinically tested.

Parenterin -- proposed as a plasma substitute by Belenkiy and co-workers. Parenterin contains 4.0-4.5 percent denatured proteins which are not fractionated by electrophoresis. Although parenterin has been found effective as a plasma substitute in cases of severe hemorrhage and shock of various etiologies, further clinical testing of the preparations is needed before it can be widely used.

Nonaphylactic protein serums No 1 and 2, and Biorastin -- nonaphylactim protein serums No 1 and 2 are prepared from bovine serum and after being processed contain only proteins which are readily assimilated by the organism, according to the authors of the plasma. Biorastin is prepared by using alkalies to extract the proteins from peas. It is presumably nontoxic and nonanaphylactogenic. No data for the complete evaluation of the value of these plasma substitutes are yet available.

Chapter 2 of the book is entitled "Plasma Volume Substitutes" and lists a group of nonprotein colloidal solutions which possess adequate oncotic pressure. These include dextran and similar preparations, polyvinylpyrollidone preparations, gelatine preparations, polyvinyl alcohol, glutamil-peptide, and capillaro-active substances.

Chapter 3 of the book is entitled "Preparations for Parenteral Protein Nutrition, (Hydrolyzates). They play an important role not as plasma substitutes, but as substances for parenteral protein nutrition. The following preparations were developed in the USSR; L-103, prepared from bovine blood serum; aminopeptide, prepared by the hydrolysis of bovine whole blood or casein with enzymes of fresh suprarenal glands or the mucosa of the small intestine; aminol', a preparation analogous to aminopeptide and obtained from citrated serum plasma; and hydrolysate TsOLIPK [Central Order of Lenin Institute of Hematology and Blood Transfusion], prepared from casein by hydrolysis with sulfuric acid and subsequent treatment with barium oxide. Experiments on animals established the effectiveness of the preparations as protein nutrition substances.

Immunology and Therapy

87. Aerogenic Vaccination Against Anthrax

"An Experiment on Mass Aerogenic Vaccination of Humans Against Anthrax," by Maj Gen Med Serv N. I. Aleksandrov, Col Med Serv N. Ye. Gefen, Lt Col Med Serv N. S. Garin, Lt Col Med Serv K. G. Gapochko, Lt Col Med Serv V. M. Sergeyev, Lt Col M. S. Smirnov, Col Med Serv A. L. Tamarin, and E. N. Shlyakhov; Moscow, Voyenno-Meditsinskiy Zhurnal, No 8, Aug 59, pp 27-32

The authors mention that some theoretical and experimental data on their extended research on aerogenic immunization against anthrax have been published previously (Voyenno-Meditsinskiy Zhurnal, No 10, 11 and 12, 1958). In introducing the research described in this article, they state:

> "The data accumulated from the study of the reactogenicity and effectiveness of the aforementioned method of immunization, obtained in experiments on animals (guinea pigs, rabbits, sheep, and monkeys), and positive results of a study of this method on humans made it possible for us, with the permission of and on recommendation of the Committee on Vaccines and Sera, Ministry of Health USSR, to proceed to more extensive testing of the aerogenic method of immunization with aerosolized anthrax vaccine, which was conducted in March 1959.
>
> "This research was the first experiment on mass aerogenic vaccination of humans, and its results are therefore undoubtedly of great interest. In carrying out the research, we attempted to test and to refine the methodology of mass aerogenic vaccination of humans under practical conditions; to test and to refine the data obtained earlier on the reactogenicity of aerogenic immunization against anthrax; to determine the comparative effectiveness of different methods of immunization against anthrax by the use of specific allergen developed and proposed in 1957 by E. N. Shlyakhov under the name 'MIEGM [Moldavskiy Institut Epidemiologii, Mikrobiologii i Gigiyeny, Moldavian Institute of Epidemiology, Microbiology, and Hygiene] anthrax allergen'."

The vaccination was performed in an ordinary district hospital room with a volume of 40 cu m, one window and a door; the room was equipped with benches, chairs, and an intercom system. Some 40-50 men were vaccinated with three sprayers during each immunization session. Five series (No 2, 13, 16, 23, and 27) of aerogenic vaccine from strains STI-1 and No 3 with an initial activity of 20-2,500 billion spores per g were used. Depending on the initial activity of the vaccine, 2-3 g were put into each spraying apparatus; a total of 4-6 g was sprayed into the room. Exposure lasted for 5-15 minutes. Immunizations were also performed with a single sprayer in a room with a volume of 20 cu m.

The concentration of live microorganisms in the air of the room and the immunizing doses received by each participant in the experiment were calculated by a method which involved confining an air sample in a gas mask equipped with a gelatin foam filter on the inside.

A total of 363 persons were subjected to aerogenic vaccination. Of these, 220 received doses of 15-63 million live microorganisms, and 143, doses of 440-640 million. Men and women between the ages of 18 and 45 were immunized. These persons were closely observed immediately following the immunizations, 263 for 7 days, and 100 for 21 days. Chest X rays and blood analyses were performed during the observation periods.

A major observation was the absence of any local or general clinically manifested reaction, temperature reaction, or other changes in the conditions of the vaccinates. Tables are given to show results of tests performed after immunizations.

Conclusions based on the results of these tests are as follows:

"Dry aerogenic antianthrax vaccine prepared from STI-1 and No 3 strains is practically areactogenic in rational doses.

"Aerogenic immunization with antianthrax vaccine guarantees pronounced immunological reconstruction of the organism of the vaccinate, which is indicated dynamically by the use of MIEMG anthrax allergen.

"Aerogenic vaccination can be used as an express method of immunization according to epidemiological indications."

It is pointed out that the use of three rooms such as the one described, or an equivalent area, makes it possible for a team of five or six men to vaccinate 1,000 persons per hour.

88. Properties of Gamaleya Polyvaccine

"Antigenic and Immunogenic Properties of the Polyvaccine of IEM imeni Gamaleya," by A. Z. Ter-Karapetyan, Central Institute for the Advanced Training of Physicians and Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 8, Aug 59, pp 50-54

References are given for previous research on the use of the agglutination, precipitation, complement fixation, and opsonophagocytic reactions, the peritoneal test, and the preventive properties test for determining immunobiological shifts in human and animal blood sera.

In the research described in this article, in addition to the other reactions mentioned, the preventive properties of sera from humans inoculated with the polyvaccine of IEM imeni Gamaleya were tested. Two inoculations were given to persons in Moscow Oblast at a one-month interval in the spring of 1957. Strains of the following cultures, obtained from the Institute imeni Gamaleya, were used as antigens for the agglutination reaction: typhoid 1203, paratyphoid B 492, Flexner dysentery 26 and 4437, and Sonne dysentery 7380. Local strains obtained from the city in which the inoculations were given were also employed. All strains were typical with respect to their biochemical properties, and were agglutinated by specific sera in high titers.

The preventive properties of sera from inoculated humans or animals were determined by two methods: animals were given different doses of serum and were then infected with a single, lethal dose of a culture; or the serum was given in a single dose and the infection was done with increasing doses.

The results of the test are discussed; the following conclusions are presented:

"1. Agglutinins with respect to typhoid, paratyphoid B, and Sonne dysentry antigens were absent in human sera before immunization with the polyvaccine of IEM imeni Gamaleya; all sera reacted positively with Flexner antigen, and the reaction reached a titer of 1:800 in 4 out of 28 cases.

"2. Agglutinins of Flexner antigen (1:400-1:1,600) appeared in all sera after two immunizations; agglutinins of typhoid and particularly paratyphoid antigen were noted in the majority of sera in titers of 1:200-1:400; no agglutinins of Sonne antigen were seen.

"3. We did not succeed in observing immunological shifts in persons inoculated with the IEM polyvaccine after using the precipitation and complement fixation reactions.

"4. Before immunization, the sera did not exert any preventive effect in experiments on mice, or only slightly protected the animals from infection with corresponding cultures; after immunization (up to 4 months), the preventive strength of all the sera was sharply increased."

89. Hypertension During Brucellosis Vaccine Therapy

"A Case of Hypertension With a Rapidly Progressing Course Which Developed During Brucellosis Vaccine Therapy," by I. M. Smirnov; Moscow, Sovetskaya Meditsina, Vol 23, No 8, Aug 59, pp 117-118

A case of rapidly progressing hypertension, rarely described in the literature, is reported in connection with the introduction of brucellosis vaccine into the human organism. The entire case history of the patient is given in detail and discussed in the text of the article.

After the diagnosis of brucellosis, a course of vaccine therapy (Rudnev's method) was instituted; the arterial pressure did not increase after the first intravenous injection of brucellosis vaccine, but did so after the third injection. The intracutaneous introduction of the vaccine also produced a marked increase in arterial pressure. The patient was discharged from the hospital and readmitted several times, but died 7 months after the onset of the disease.

The author states in conclusion that the mechanisms of the action of brucellosis vaccine in the development of hypertension are not known and recommends immediate cessation of vaccine therapy when a tendency toward increased arterial pressure is evidenced in the patient.

90. Study of Brucellosis Vaccine Therapy

"The Problem of Studying the Remote Results of Brucellosis Vaccine Therapy," by L. D. Levina, Chair of Infectious Diseases, Sverdlovskiy Medical Institute; Moscow, Sovetskaya Meditsina, Vol 23, No 7, Jul 59, pp 88-92

This report presents results of a follow-up study of 210 patients treated for both acute and chronic forms of brucellosis at the Clinic of Infectious Diseases, Sverdlovskiy Medical Institute. All of these patients had received a complete course of two-stage intravenous vaccine therapy (by G. P. Rudnev's method) in conjunction with antibiotics or sulfanilamides, various symptomatic agents, and physiotherapeutic procedures. Upon discharge, 147 of the patients were in a phase of complete compensation; 58, in a phase of incomplete compensation; and 5, with no improvement in their conditions. Follow-up data were collected for 1-4 years.

Two tables and a graph are included to show the frequency of relapses, results of therapy in patients with different forms of the disease, and results of therapy in patients with different degrees of compensation on discharge from the hospital. Analysis of the data collected led to the following conclusions:

"1. A 1-4 study of the remote results of brucellosis vaccine therapy showed that relapses of the disease occurred in 68.1% of the patients.

"2. Some 47.4% of the relapses occurred during the first 3 months after discharge from the hospital; half of them (23.3%) occurred during the first month. We discovered that the early appearance of relapses was caused by a sharp variation in environmental conditions after the patient was discharged from the hospital while the disease process was insufficiently compensated.

"3. The greatest number of relapses under Ural conditions was noted in March. The second highest number was observed during the summer months (July-September). Such relapse dynamics are brought about by a combination of local climatic factors and working conditions.

"4. The prophylaxis of brucellosis relapses should consist of maximum protection of the patient's organism from provocative factors, particularly during the first months after his discharge from the hospital. The correct organization brucellosis patient's work and periodic observation in a clinic are highly important."

91. Low Vitamin C Content Observed in Pregnant Brucellosis Patients

"Vitamin C in Pregnant Women Suffering From Brucellosis," by N. T. Rayevskaya, Med. Zh. Uzbekistana, 1958, No 8-9, 67-70 (from Referativnyy Zhurnal -- Khimiya i Biologicheskaya Khimiya, No 9, 10 May 59, Abstract No 11663, by S. Khayes)

"Ninety pregnant women suffering from brucellosis were examined. In a considerable number of them, a lowered level of vitamin C was observed in the blood during impending termination of pregnancy or at the time of termination of pregnancy. It is recommended that the therapy include the use of vitamin C."

92. Dielectrometrics Useful in Immunobiological Calculations

"The Use of Dielectrometry for Calculating the Results of Immunobiological Reactions," by A. I. Nesterova; Moscow, Biofizika, Vol 4, No 4, 1959, pp 495-498

The authors express the opinion that the theoretical and practical importance of immunological methods of investigation would be greatly augmented by the development of a simple and precise method of calculating the antigen-antibody reaction. They propose a study of the dielectric permeability of antigens, antibodies, and their suspensions as a step toward the attainment of this goal. This article concerns a method of determining the dielectric permeability of substances; the authors also present their own data on the quantitative evaluation, by this method, of results of the interaction of certain antigens and antibodies. Dielectric permeability, it is pointed out, is closely connected with very minute changes in the chemical structure of substances, and with changes in their aggregate condition. The analysis is very precise and rapid.

A diagram of the dielectrometer used is given; the apparatus, based on resonance phenomena, and the methodology of the experiments are described in detail in the text. A table shows results of various measurements made.

The use of dielectric permeability measurement is recommended for the study of various other aspects of medicine and biology.

93. Chinese Conduct Studies on Dysentery Protection

"Experimental Infection With Shigella Paradysenteriae Induced in the Cornea and Conjunctiva of the Guinea Pig. II. Observations on the Immune Response Following Infection," by Feng Chen-nan (馮 振 南), Chinese Academy of Medical Sciences, Fang Kang (方 紅 圃) and Hsieh Shao-wen (謝 少 文), supervisors; Peiping, Jen-min Pao-chien (People's Health), Vol 1, No 7, 1959, pp 605-608

This item reports observations on the nature of immunity induced by experimental Shigella paradysenteriae infection of the eyes of guinea pigs. The studies were undertaken to investigate "as yet unsolved problems of dysentery immunization."

On the basis of their experimental results and those reported by other scientists, the authors conclude that an intestinal attack of dysentery can confer immunity localized in the human intestinal tract. But immunity so acquired is not lasting because the immune bodies cannot remain there. Moreover, the low degree of immunity attained is easily destroyed by the interaction of various factors. To solve the problem of dysentery protection, they suggest the development of an attenuated vaccine which can be taken orally on a regular basis to give (continued) stimulation of below-threshold infection, or the finding of a suitable site in the intestinal wall for the storage of antigens.

Oncology

94. Effect of Propyl Gallate on Rous Sarcoma Virus

"Loss of the Blastomogenic Properties by the Rous Sarcoma Virus Under the Effect of Propyl Gallate," by N. M. Emanuel, Corresponding Member of Academy of Sciences USSR, and L. P. Lipchina; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 5, 11 Apr 59, pp 1148-1150.

Hens were used in experiments which were conducted to determine the possibility of inactivating tumorigenic viruses and deprive filtrates containing tomorigenic viruses of their blastomogenic properties by the application of propyl gallate, one of the inhibitors of the chain oxidation process. Transplants of tumorous cells and filtrates of Rous's Sarcoma were used in the experiments. Propyl gallate was applied in 0.75, 0.15, and 0.075 percent solutions. On the basis of the experiments, the author writes, it may be assumed that an 0.75-percent solution of propyl gallate deprives the virus and the virus containing filtrate of their blastomogenic properties.

95. Hormonal Therapy of Prostate Gland Cancer

"Experimental Therapy of Cancer of the Prostate Gland," by N. I. Shapiro and V. I. Rozhdestvenskiy, Urological Division of the Institute of Oncology, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 6, 1959 pp 710-716

The article describes the methods of analysis and diagnosis and the results of experimental hormonal therapy of cancer of the prostate gland. Estrogen preparations were used in the therapy of the disease. A marked improvement in the patients was noted and as a result, disuria ceased, pain diminished, and the size of the tumors decreased. Observations over a period of time revealed that patients who received hormonal treatment lived longer than those who were not given hormonal therapy. The author thinks that the hormonal treatment of cancer of the prostate gland should be considered as one of the more important methods of treating the disease.

96. Effect of Drugs on Antineoplastic Action of Some Preparations

"On the Effect of Medicinal Substances on the Antineoplastic Action of Ethyleneimine Derivatives in Experiments on Animals," by V. A. Chernov, Laboratory of Experimental Chemotherapy of Tumors, Division of Chemotherapy, All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 6, 1959 pp 686-698

Rats were used in experiments which were conducted to determine the effectiveness of TEF (2, 4, 6-triethyleneimine-S-triasin); methoxy TEF (2-methoxy-4.6-diethyleneimine-S-triasin); TEP (triethyleneimine of phosphoric acid; dipin tetraethyleneimide piperazine-N.N1 of diphosphoric acid) in the therapy of malignant growths when used in combination with vitamins, sensatives, soporifics, anesthetics, and ganglioblocking, leikopoiesis stimulating, and thyroid gland stimulating drugs. TEF, methoxy-TEF, TEP, and dipin, on the basis of their chemical structures, belong to the group of the so-called alkylating agents and are characterized by high antineoplastic activity.

The experiments established that antimycine used in combination with dipin somewhat enhanced the antineoplastic action of the latter; that caffeine in combination with TEF had a somewhat inhibiting effect on the action of the TEF; that pachycarpine in combination with TEF had an enhancing effect on the action of the latter; that nicotine when used in combination with methoxyTEF had no effect on the antineoplastic action of the latter; that vitamin B_1 and some other drugs used in combination with vitamin B_1 somewhat inhibited the action of the antineoplastic preparations.

97. Chemotherapy of Malignant Tumors

"On the Chemotherapy of Malignant Tumors on the Basis of Data Presented at the Conference Held in Riga 6-7 June 1959," by Prof L. M. Golber; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 7, 1959, pp 118-120

A conference on the problems of the search for and investigation of chemotherapeutical preparations effective in the therapy of cancerous growths was held in Riga on 6-7 June 1959. Among the papers read was one by Academician E. A. Giller who reported that at the Institute of Organic Synthesis of the Academy of Sciences Latvian SSR studies are being conducted on the possibility of developing new antineoplastic preparations by introducing toxiphoric functions into such biologically important compounds as

nucleotides and polynucelotides. He reported also that considerable work is being done with organophosphorus compounds and their analogs, and in particular with TioTEFA (triethylenethiophosphoramide). TioTEFA has been found to be more effective, less toxic, and better tolerated by patients than are other cytostatic preparations now being used to inhibit the growth of different types of malignant growths. All other reports presented at the conference were devoted to accounts of results of the experimental and clinical application of TioTEFA. The concluding report of the conference was read by A. G. Pinus. He also spoke of the beneficial results obtained in the therapy of cancerous growths with TioTEFA, but warned that overdosages of the drug and its application without hematological control may cause serious disorders and lead to the development of acute leukopenia. An individual approach in regard to the dosages to be administered, and constant control of the blood composition are necessary.

98. Tumor Therapy With Peucedanine and Phosphoramides

"On the Effect of Peucedanine and Phosphoramides on Transplantable Animal Tumors," by Ye. M. Vermel and S. A. Kruglyak-Syrkina, All-Union Scientific Research Institute of Medicinal and Aromatic Plants; Moscow-Leningrad, Vorposy Onkologii, Vol V, No 7, 1959, pp 43-51

Peucedanine and peucedanine in combination with phosphoramides were administered to mice to determine the effectiveness of the drugs when used as supplementing agents in the therapy of malignant growths. Peucedanine-4-methoxy-5-isopropylfuro-2,3,5,7-coumarin -- is a slightly yellow crystalline powder and has a melting point of 98-100 degrees; it is readily soluble in alcohol, chloroform, benzene, and other organic solvents and oils, but is almost insoluble in water. For experiments conducted in vitro, peucedanine was used as a suspension in physiological salt solution; for administration to the animals, it was applied as a solution in plum or sunflower seed oil. The phosphoramides were used in a physiological salt solution, prepared immediately before application.

The experiments established: (1) peucedanine when used in vitro has considerable anticancerous activity; (2) when administered to animals peucedanine inhibits the growth of Ehrlich's ascitic tumor; it has no effect on mouse sarcoma 180, sarcoma 45, and Gueren carcinoma; (3) phosphoramides used in vitro in combination with peucedanine kill most of Ehrlich's ascitic cancer cells within a short time; and (4) the combined use of peucedanine and phosphoramides in animals has a therapeutic effect greater than that which is displayed by each of the drugs when applied separately; the average DL_{50} dose of peucedanine when administered to mice orally is 315 milligrams per kilogram of body weight.

99. Degranol in Therapy of Cancer

"Experimental and Clinical Tests of the Application of Degranol," by Sandor Benko, Orv. hetilap. (Hungary), 1958, 99, No 27, 914-917 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 59, Abstract No 55718, by A. N. Ivanov)

"Brown-Pearce cancer was transplanted to both testes of rabbits (10). Seven days later, openings were made in the abdominal area of the animals under anesthesia, the abdominal aorta was clamped below a point where the spermatic arteries exit, and 4 milligrams per kilogram body weight of degranol were introduced into the aorta. In the author's opinion, all of the degranol applied is concentrated in the testis when this method is used. Three weeks later the animals were killed and examined. It was established that degranol inhibited the growth of Brown-Pearce cancer to a considerable degree and prevented metastasis. When administered intravenously to dogs in doses of 1-4 milligrams, it prevented the development of leukocytosis in the animals which preliminarily received a myelo-toxic serum. Degranol was used clinically in the treatment of 22 patients. Remission was noted in 4 of 11 patients suffering from lymphogranulomatosis; subjective improvement was noted in two patients; the disease continued to progress in the rest of the patients. Considerable improvement was noted in two patients suffering from leukemia and in one patient ill with malignant reticulosis. In the author's opinion, the cytostatic action of degranol is more strongly expressed when it is administered intravenously."

100. Periodic Febris in Lymphogranulomatosis

"Characteristics of Periodic Febris in Three Cases of Lymphogranulomatosis," by L. Derer and L. Sandor, Bratisl. lekar. listy (Slovakia), 1958, 2, No 1, 3-8 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 59, Abstract No 55734)

"A sharp rise in temperature occurring every 10 hours was observed in a patient ill with lymphogranulomatosis. A 15-day cycle in temperature rise was noted in another patient. After treatment with chlorethylamine (TS 160), it became a regular 20-day cycle. In a third case of lymphogranulomatosis the rise in temperature was repeated on the 8th, 12th, 18th, and 23d days."

101. Methylene Blue Discoloration Test for Diagnosing Malignant Neoplasms

"The Diagnostic Significance of a Disturbance in the Reducing Capacity of Blood Serum in Malignant Neoplasms," N. A. Konovalova, Laboratory of the First Novocherkassk City Hospital; Moscow, Laboratornoye Delo, No 4, Jul/Aug 59, pp 27-29

The author describes a simple and sensitive method for determining the time factor in the discoloration of methylene blue by blood serum, which reflects the existence of malignancy. The method is as follows: 0.2 ml of a 0.15% aqueous solution of methylene blue and one ml of blood serum are placed in a test tube, mixed carefully, and allowed to stand in a boiling water bath. The time required for complete discoloration is noted. The reaction is negative if it takes 8-9 minutes or less; it is doubtful if it takes 9-10 minutes; and it is considered positive if it takes more than 10 minutes.

Results of tests on 92 patients show that this test is positive in 93% and negative in 7% of the cancer patients; in patients suspected of malignant neoplasms, it is positive in 85%, negative in 10% and doubtful in 5% of the cases; and in healthy people, the results are 14.8% positive, 73.6% negative, and 11.6% doubtful.

102. Committee on Cancerogenic Substances Established in USSR

"Committee on Cancerogenic Substances" (unsigned article); Moscow, Meditsinskiy Rabotnik, 8 Sep 59

A Committee on Cancerogenic Substances (Komitet po Kantserogennym Veshchestvam) has been established under the State Sanitation Inspectorate to coordinate scientific research in the study of these substances and to work out scientifically sound prophylactic measures.

The committee will be responsible for compiling a plan for the scientific research in the field of the study of cancerogenic substances and the prophylaxis of cancer. The committee will also develop various instructions, sanitation rules, and methodological directions.

The work of the committee will be conducted at the Institute of Experimental and Clinical Oncology, Academy of Medical Sciences USSR.

103. Czechoslovak Physician Discusses Alleged Soviet Cancer Cure

"Missiles Against Cancer," by Milos Cerny; Prague, Zapisnik 59, 7 Aug 59, p 7

In reply to a reader's inquiry, appearing in the source, which is a monthly publication of the Main Political Administration of the Czechoslovak People's Army, Dr Milos Cerny, discusses the incidence of cancer throughout the world in general, and Soviet developments in finding a cancer cure in particular.

Cerny states that thus far treatment of cancer can be divided into three groups: surgery, radiation, and chemotherapy. He feels that because of the lack of positive results from chemotherapy, this method has thus far been considered without great significance. He explains that physicians have long known of the existence of certain chemicals which are capable of destroying cancerous cells; however, they also destroy healthy cells. Thus, the use of chemotherapy in the fight against cancer is limited by the fact that the drugs damage the entire organism.

However, Cerny continues, Soviet scientists have been successful in guiding medication directly into the tumor itself or into the organ which is attacked by cancer. The principle they use, according to Cerny, is based on the theory that an additional chemical group attached to the basic molecules of the cancer-killing drug acts as a sort of "rudder" and guides the anticancer molecules directly into the tumor. This development is based on the fact that various types of tumors are able to select certain typical materials for their own use from the blood stream. If the material the tumor collects is then coupled to the drug, this drug accumulates in the tumor and destroys it.

Based on this principle, the Soviet Union has produced the drug "Sarcolysin," containing a toxic (therapeutic) extract of embichine. When given in doses which can be tolerated, embichine itself has only a mild therapeutic effect, on a certain type of tumor found in rats and used in research. However, it is able to destroy this tumor completely.

Cerny continues by stating that a whole series of other chemical compounds of "Sarcolysin" is based on the same principle; these compounds are virtually harmless to the entire organism, but with their help, it is possible to effect complete cures with certain types of tumors. It is now possible to produce other compounds which may have a decided therapeutic effect on still other types of tumors.

The article then stresses, in bold type and underscored, that "it is, however, necessary to emphasize that all medications thus far tested are in a stage of development and are in use only for experimental therapy at selected clinics."

The author then states that Czechoslovakia is also working on this general problem. Academician Fratisek Sorm is one of the researchers engaged in this field. Cerny adds that the fight against cancer is made doubly difficult because there are so many different kinds of malignancies which differ from each other, and which also differ in their specific reactions to individual therapeutic compounds.

In closing, the author assures his readers that the fight against cancer is rapidly becoming the most pressing problem and that the time is coming when cancer will cease to be the scourge of mankind.

104. Review of Book on Cancer

"Opukholi, ikh Raspoznavaniye, Lecheniye, i Profilaktika," (Tumors, Their Diagnosis, Therapy, and Prophylaxis) by L. M. Nisnevich, reviewed by A. P. Shanin, V. N. Demin, and A. V. Chaklin; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 7, 1959, pp 115-117

This presents a critical review of a handbook on oncology in which data and information on the etiology, methods of diagnosis, therapy, and prophylaxis of tumors are presented. The book contains an introductory chapter and five textual chapters.

In the introductory chapter the author deals with such diverse problems as the organization of cancer control, theory of the effect of Roentgenotherapy on malignant tumors, methods of Roentgenotherapy, physical basis of radiation therapy, etc. Most of this material, the critics write, belongs in Chapter 5, where data on the therapy of tumors are presented.

Chapter 1 of the book is devoted to a report on the various theories of the etiology of tumors. It is regrettable, say the reviewers, that the author, while writing about the chemical and virus hypotheses of the etiology of tumors, completely neglects to mention the polyetiological theory of tumor development.

Chapter 2 of the book deals with the basic principles of the methods of examining patients suffering from tumors. Data on various preblastomous conditions are presented in Chapter 3. Attention is called to the need to carefully examine the patients and identify benign and malignant tumors. Chapter 4 is not mentioned in the review.

Chapter 5, entitled "Clinical Symptomatics and Therapy of Cancer," is the most important chapter of the book. After providing a clinical picture and methods of treating benign tumors, the author describes in detail the clinical picture and methods of treating malignant growths. Surgical procedures are described in detail. Chemotherapeutic and radiation therapy are discussed.

The book has many shortcomings; however, the critics write, despite the shortcomings, the book will be useful to surgeons, therapeutists, gynecologists, otorhynolaringologists, urologists, and other specialists.

105. Antibiotic Therapy of Typhoid Fever

"Effectiveness of Different Antibiotics in the Treatment of Typhoid Fever Patients." by Zh. G. Popushoy, Tr. Kishinevsk. Med. in-ta (Works of the Kishinev Medical Institute), 1958, 7, 114-116 (from Referativnyy Zhurnal--Biologiya, No 11, 10 Jun 59, Abstract No 51548)

"Patients (46) suffering from primary and secondary typhoid fever were treated with levomycetin (I) (24 hour doses of 4-6 grams until the temperature was lowered, and then half of the original doses for 2-3 days) and with biomycin (II) (doses of 1.6-2.0 grams in 24 hours until temperature was lowered, and then 0.8-1.0 grams for 2-3 days). A beneficial therapeutic effect was obtained. Under the effect of (I), fever disappeared after 2.7 days; under the effect of (II), 2.2 days. Side toxicoallergic reactions to (I) were noted in 7 of the 20 patients, and to (II) in 3 of the 26 patients. (I) and (II) did not suppress immunological reactions in the typhoid patients."

106. Therapy of Some Skin Diseases With Colimycin

"Colimycin in the Therapy of Some Purulent Skin Diseases," by S. A. Shteynlukht and L. N. Smirnova, Sb. Nauchn. trud. Leningr. n.-i. in-t Antibiotikov (Collection of Scientific Work of the Leningrad Scientific Research Institute of Antibiotics), 1958, 1, 372-375 (from Referativnyy Zhurnal--Biologiya, No 11, 10 Jun 59, Abstract No 51553)

"On the basis of observations made on 56 patients, it was established that ointments containing 0.5-5.0 percent colimycin are effective when used in the treatment of patients afflicted with piococci ulcers, folliculitis, bullous pyoderma, and of some patients suffering from infectious intertrigo of the large folds, diffused chronic streptoderma, and impetigenous eczema. No resistance to colimycin developed for a period of 30 days in the treatment of patients suffering from piococci ulcers. In the treatment of patients suffering from chronic streptoderma and impetigenous eczema, colimycin should be applied for periods of no longer than 4-6 days because of the possibility of aggravating the pathological process."

107. Effect of Hydrocarbon Vapors on the Human Organism

"On the Problem of the Chronic Effect of Hydrocarbon Vapors on the Human Organism," by S. Kh. Nikolov, Nauchn. tr. Kubansk. Med. In-ta (Scientific Works of the Kubansk Medical Institute), 1958, 16 (29), 114-124 (from Referativnyy Zhurnal--Biologiya, No 11, 10 Jun 59, Abstract No 51656, by the author)

"Functional changes in the nervous system of a number of workers caused by exposure to the prolonged action of an industrial environment containing hydrocarbon vapors in concentrations of 0.3-0.8 milligrams per liter of air were noted. These changes were marked by a rise in absolute chronaxy and changes in the cardiovascular system which were characterized by the slow-down in the rhythm of the cardiac contractions and a drop in arterial pressure. An increase in the respiration rate, and a decrease in the length of time breath could be voluntarily held were also noted. These changes were persistent, for they failed to disappear after a 16-hour break in work."

108. Hydrogen Sulfide Intoxication

"On the Role of Adenosine Triphosphoric Acid and Adenosine Triphosphatase of the Blood Serum in the Mechanism of Hydrogen Sulfide Intoxication," by C. N. Sinitsyn, Inform. Byul. Mosk. n.-i. in-t Sanitarii i Gigiyeny (Information Bulletin of the Moscow Scientific Research Institute of Sanitation and Hygiene), 1958, No 21, 89 (from Referativnyy Zhurnal--Biologiya, No 11, 10 Jun 59, Abstract No 51657)

"Experiments carried out on rats (84) established that under the influence of hydrogen sulfide in concentration of 1.7-2.6 milligrams per liter, the adenosine triphosphate content in the blood serum is lowered to 0--0.2 milligram percent. Hydrogen sulfide in a concentration of 1.5-2.5 milligrams per liter reduces the activity of adenosine triphosphatase from 1/2 to 1/9 of that of the control."

109. Toxicity of Difacil Derivatives

"Pharmacology of Quaternary Derivatives of Difacil, "by Ye. V. Chaykovskaya, Tr. Leningr. san.-gigiyen. med. in-ta (Works of the Leningrad Sanitary-Engineering Medical Institute), 1958, 37, 153-162 (from Referativnyy Zhurnal--Biologiya, No 11, 10 Jun 59, Abstract No 51321, by the author)

"When the tertiary nitrogen of difacil is converted into quaternary by the addition of the methyl, ethyl, and benzyl radicals, the toxicity of the preparation is increased fourfold. Quaternary alkyl derivatives

of difacil possess a stronger atropine-like action than difacil, have a more prolonged gangliolytic effect and less spasmolytic properties than difacil. When a benzyl radical is added to difacil, the atropine-like action of the latter disappears, although its spasmolytic and gangliolytic properties are retained."

110. Benactyzine as a Delirium-Inducing Agent

"Experimental Psychosis Following the Administration of 200 Milligrams of Benactyzine," by Gros S. Vojtechovsky, Ceskoslov. psychiatr. (Czechoslovakia), 1958, 6, 369-376 (from Meditsinskiy Referativnyy Zhurnal, Section 1, No 7, Jul 59, p 133)

"Experimentally induced psychosis following the administration of 200 milligrams of benactyzine is described. A state of amentia with visual and auditory hallucinations and occupational delusions followed by amnesia developed. From a psychopharmalogical viewpoint, benactyzine may be grouped with delirium-inducing agents."

111. Effect of Nitrochlorobenzene Intoxication on Nitrogen Metabolism

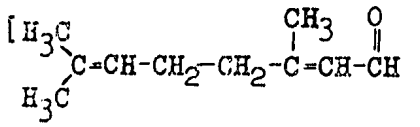
"Disturbed Processes of Nitrogen Metabolism in the Brain With Nitrochlorobenzene Intoxication," by E. A. Goriyenko and S. R. Frenkel, Uch. zap. Ukr. n.-i. in-t Gigiyeny Truda i Profzabolevaniy (Scientific Notes of the Ukrainian Scientific Research Institute of Labor Hygiene and Occupational Diseases), 1958, 27, 115-120 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 14, 25 Jul 59, Abstract No 19161, by G. Zayeva)

"Experiments conducted on white rats established that in cases of acute nitrochlorobenzene intoxication, the concentration of the amide nitrogen in the proteins of the cerebrum tends to decrease, while the amide nitrogen in the glutamins tends to increase sharply (an average of 16.34 milligram percent). The content of the amide nitrogen in the proteins in nitrochlorobenzene intoxication cases is in a number of instances 4-5 times lower than normal as compared with that in nonproteins. Glutaminic acid is recommended as a the therapeutic agent for restoring the normal metabolic processes in the nervous system in cases of nitrochlorobenzens intoxication."

112. Effect of Vikasole and Citral on Prothrombin Time

"Effect of Vikasole and Citral on Modification of Prothrombin Time and the Development of Atherosclerosis in Guinea Pigs," by V. A. Protesnko, A. A. Moskalenko, and V. V. Simonov, Sb. nauchn. rabot stud. Krymsk. med. in-t (Collection of Scientific Works by Students of the Crimean Medical Institute), 1958, 1, 131-136 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 14, 25 Jul 59, Abstract No 19116, by I. Elman)

"The cholesterine content in the blood of guinea pigs which were fed a cholesterine diet for a prolonged period of time (0.25 gram per kilogram of body weight daily) and which received citral



subcutaneously, Lekarstvennyye Sredstva, by M. D. Mashovskiy, Medgiz, Moscow, 1957, p 294] averaged 95 milligram percent, while in the animals which received vikasole [bisulfate derivative of 2-methyl-1,4-naphthoquinone, Lekarstvennyye Sredstva, by M. D. Mashkovskiy, Medgiz, Moscow, 1957, pp 319-320], the cholesterine content in the blood averaged 88 milligram percent. In the control group of animals also kept on a cholesterine diet but not receiving citral and vikasole, the blood content of cholesterine rose to 128 milligram percent. The prothrombin time in the animals which received citral and vikasole increased."

113. Side Reactions to Antibiotics

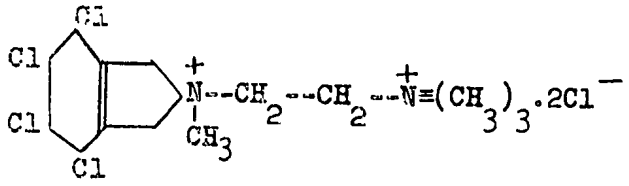
"Main Clinical Manifestations of the Side Action of Antibiotics," by U. A. Askarov (Moscow), Third Chair of Therapy, Central Institute for the Advanced Training of Physicians; Moscow, Terapevticheskiy Arkhiv, Vol XXXI, No 7, Jul 59, pp 32-43

The article briefly reviews foreign and domestic literature on the side effects of antibiotics. A number of case histories of allergic and toxic side reactions to different antibiotics, and the effect of antibiotics on the blood are cited. It is emphasized that side reactions to antibiotics can be prevented by the attending physician by the determination of the sensitivity of the patient to one or another antibiotic; by the adjustment of dosages; by combining antibiotics with other drugs to counteract the reactions of the organism to the antibiotics.

114. Khizindamone--a Ganglioblocking Drug

"Pharmacological Characteristics of Khizindamone, the Dichloromethylate of N-(beta-dimethylaminoethyl)-4,5,6,7-tetrachloroisoindoline. Report 1. Effect of Khizindamone on the Cholinoreactive Biochemical Systems and Reflex Reactions of the Organism," by A. L. Mndzhoyan and V. M. Avakyan; Yerevan, Izvestiya, Biologicheskiye Nauki, Academy of Sciences Armenian SSR, Vol XII, No 7, Jul 59, pp 13-22

Cats, dogs, and white mice were used in experiments which were carried out to determine the ganglioblocking properties of khizindamone, a compound synthesized at the Institute of Fine Organic Chemistry, Academy of Sciences Armenian SSR Khizindamone is the dichloromethyl of N-(beta-dimethylaminoethyl)-4,5,6.7-tetrachloroisoindoline, and has the following structural formula:



Khizindamone is a white crystalline powder, readily soluble in water. It has a melting point of 264 degrees C and has a bitter taste. An analogue is manufactured abroad under the name of ecolid, and is used in the therapy of hypertonia. The experiments established that khizindamone is an effective ganglioblocking drug with a selective action. In doses of 0.1 milligram per kilogram of body weight administered to cats and dogs, it blocked the neuro-cholinoreactive systems of the sympathetic ganglia, of the glomus carotideum, of the adrenal medulla, and to a lesser degree of the cardiac and pulmonary parasympathetic ganglia. The experiments on mice established that khizindamone also blocked the neuro-cholinoreceptors of the central nervous system: it had an antispasmodic effect in spasms induced by nicotine.

115. Magnesium Sulfate as an Antidote in Fluorine Intoxication

"On the Antidote Action of Magnesium Sulfate in Fluorine Intoxication," by V. G. Loshchilova, Tr. Kirovskovo s.-kh. in-ta (Works of the Kirov Agricultural Institute), 1957, 12, No 24, 111-120 (from Referativnyy Zhurnal--Biologiya, No 11, 10 June 59, Abstract No 51646, by R. S. Vorob'yeva)

"Experiments were carried out on cold-blooded (small roaches, tadpoles, frogs) and warm-blooded (rabbits) animals. The cold-blooded animals were kept in aquariums containing NaF (I) and $MgSO_4$ (II) in concentrations of 0.5:1,000 to 1:1,000. NaF in concentration of 1:1,000

killed all of the fish and tadpoles within 24 hours, and the frogs within 3-14 days. The addition of (II) to (I) in an equal volume prolonged the lives of the fish to 4 days and of the tadpoles to 6 days. The frogs displayed a greater tolerance to the action of (I) than did the fish and the tadpoles. (I) in doses of 0.4-0.5 grams per kilogram of body weight in 10 milliliters of water was introduced into the stomach of the rabbits through a tube. Ten to 15 minutes later, 5 grams of (II) in 10 milliliters of water was also introduced into the stomachs of the animals. Strong salivation, an increase in the heart beat and respiration rate, spasms, and uncontrolled urination were observed in the animals who were administered (I). The animals died within 3 hours as a result of asphyxia. Autopsies revealed hyperemization of the stomach mucosa; hemorrhages and ulcerations of some areas. In most cases, the animals who were administered (I) and (II) survived (80 percent)."

116. Anticoagulating Effect of Some Halogenated Preparations

"Anticoagulating Effect of Halogenated 2-(alpha-naphthyl)-indandiones-(1,3)," by Vladimir Kovalcik, Josef Pechan, Klara Zollnay, Viera Fischerova, Mikulas Furdik, Pavo Hrnciar, Ceskosl. farmac. (Slovakia), 1958, 7, No 5, 251-254 (from Referativny Zhurnal--Khimiya, Biologicheskaya Khimiya, No 14, 25 Jul 59, Abstract No 19090, by S. Krivobokova)

"The hypoprothrombinemic action of 2-(alpha-naphthyl)-indandiones-(1,3) (I) halogenated with chlorine, bromine, and iodine in the fourth position of the naphthalene ring was studied in rabbits. It was found that the halogenated derivatives of (I) are considerably more effective than the original substance. The bromine and chlorine derivatives are less toxic. The process of synthesis and the properties of the halogenated derivatives of (I) are described."

117. Toxigenic Properties of B. Coli and Its Sensitivity to Antibiotics

"Toxigenic Properties of B. Coli Cultures of Different Serological Groups and Their Sensitivity to Antibiotics," by V. N. Chernova and Li Chun, Chair of Microbiology, Leningrad Pediatrical Medical Institute; Moscow, Pediatriya, Vol 37, No 8, Aug 59, pp 86-89

Research was done to determine whether the ability to form endotoxins is a property common to pathogenic as well as nonpathogenic serological types of B. coli and to establish the extent of the resistance of B. coli cultures to some of the new antibiotics. Forty-three strains were studied. The investigations conducted on mice and rabbits established the following:

The property of B. Coli to produce highly active endotoxins is found for the most part in the pathogenic strains which belong to the O111 serological group.

Producers of an active endotoxin have been found in about 60 percent of the B. coli strains which do not belong to the serological types O111, 055, and 026.

Full-grown animals have been found to be more sensitive to the endotoxin than were young animals.

All cultures of B. coli have been found to be sensitive to micerine and neomycin in vitro.

118. Yugoslavia Begins Production of Antibiotics

"'Galenika' Has Begun Trail Production of Terramycin," by S. S.; Belgrade, Borba, 24 Aug 59, p 4

The "Galenika" Pharmaceutical and Chemical Products Factory in Zemun has begun trail production of oxytetracycline, known abroad as terramycin. The new antibiotic will appear on the market by the end of 1959. The factory will produce 3,000 kilograms of this antibiotic annually.

Laboratory work is in progress for realizing production of streptomycin.

It is expected that by the end of November, production of a drug with antirheumatic effects, known as "Novalgin" abroad, will be begun.

A new drug, "Biophil," against tuberculosis will be marketed by the end of November.

Physiology

119. Visual and Motor Analysors Studied

"Some Features of the Cortical Terminals of Visual and Motor Analysors in White Rats," by E. N. Popova; Moscow, Arkhiv Anatomii, Gistologii, i Embriologii, No 6, Jun 59, pp 11-15

The author of this article states that a study of the neuron structure of visual and motor analysors in the cortical terminals of white rats showed that, despite the poor differentiation of the cerebral cortex neurons in these animals, the motor cortex neurons differ from the visual cortex neurons.

The motor cortex neurons are better developed and usually have more dendrites which branch out in a very complex manner than the visual cortex neurons. The process of pyramidization is more pronounced in the neurons of the motor cortex than in those of the visual cortex.

Apparently, the difference in the structure of neurons is determined not only by the functional significance of various regions of the cerebral cortex, but also by the part that the motor and visual analysors play in the process of adaptating the organism to its immediate environment.

120. Effect of Sodium Bicarbonate Infusion on Resuscitation

"The Effect of Sodium Bicarbonate on the Restoration of Vital Functions After Clinical Death Caused by Hemorrhage," by O. N. Bulanova and K. S. Koseleva, Laboratory of Experimental Physiology for Reviving Organisms; Moscow, Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya, Moscow, Vol 3, No 2, Mar/Apr 59, pp 59-66

It has been shown in previous reports by the authors that during the period of clinical death caused by hemorrhage, and especially at the beginning of the restoration period after clinical death, many acidic products of metabolism, mainly organic acids, are detected in the blood of animals. Their presence changes the acid-base equilibrium and shifts it to the acid side. Therefore, it seemed advantageous to find methods for halting the shift to acidosis more quickly in reviving animals. Tests were performed on dogs.

The following conclusions are presented:

"1. During the restoration of the vital functions in dogs 5-7 minutes after clinical death caused by hemorrhage, sodium bicarbonate contributes to the rapid halting of the shift to acidosis in the blood (determined from the alkaline reserve), to the speedy restoration of the vital functions, and to an increase in the number of surviving animals as compared with the controls.

"2. The greatest effect is attained by administering an 8% solution of sodium bicarbonate in a ratio of 0.1-0.15 g/kg by drip infusion during the short period of restoration of cardiac activity and before the onset of pupillary reflexes, i.e., during the first 6-12 minutes of the restoration period.

"3. Increasing the dose of sodium bicarbonate leads to the development of alkalosis and noticeably deteriorates the condition of the animals.

"4. Acidosis plays a great role in the onset and development of pathological processes noticed during the restoration of vital functions of an organism."

Public Health, Hygiene, and Sanitation

121. Harmful Aerosols in the Air at Plants Producing Hard Alloys

"Hygienic Assessment of Aerosols Formed in the Production of Hard Alloys," by Candidates of Medical Sciences S. S. Kaplun and N. V. Mezentseva, Chair of Hygiene of Labor, First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov; Moscow, Gigiyena i Sanitariya, Vol XXIV, No 6, Jun 59, pp 16-22

Observations and tests carried out in plants manufacturing hard alloys established that in the course of production, large quantities of dust containing aerosols of tungsten, titanium, and cobalt are liberated into the air and that these aerosols have a harmful effect on the organism of the workers. It was established also that cobalt aerosols constitute the main danger to the health of the workers. On the basis of tests, it was determined that the cobalt content in the air should not exceed 2 milligrams per cubic meter of air. Furthermore, it is suggested that steps be taken to reduce the content of metal aerosols in the air and that all workers engaged in the production of the alloys should be medically examined at least twice a year.

Radiology

122. Shifts in Glucose Absorption Noted in Different Diets During Radiation Sickness

"The Dynamics of Glucose Absorption in the Small Intestine During Radiation Sickness Against a Background of Different Diets," by S. R. Perepelkin and I. I. Knyazev, Moscow Institute of Hygiene; Moscow, Voprosy Pitaniya, Vol 48, No 4 Jul/Aug 59, pp 34-41

Experiments were conducted on dogs for the purpose of studying glucose absorption shifts in radiation sickness against a background of various diets. The following are the author's conclusions:

"1. Changes in the absorption capacity of the small intestines in dogs following the administration of isotonic (5.4 %) and hypertonic (10 %) glucose solutions under radiation sickness conditions had a sharp, wave-like nature.

"2. The acute development of radiation injury leads finally to the suppression of the glucose absorption process.

"3. During the subacute development of radiation injuries with a subsequent transition into the chronic form, various dynamic shifts in the resorptive activity of the small intestine develop. These shifts are determined, to some extent, by the components of nutrition. For example: against a background of milk-egg rations, the deviation from the normal toward decreased or increased glucose absorption was not so significant; feeding the animals meat or liver diets produced strong shifts characterized by sharp changes in increased or decreased absorption.

"4. The supplementary administration of vitamins C, P, and PP against a background of milk-egg rations brought about sharp, wavelike disturbances in absorption with a subsequent tendency toward normalization.

"5. With the acute and subacute development of radiation sickness against a background of a milk-egg diet, and on the feeding of a meat and liver diet to the animals for the first time after irradiation, when an isotonic glucose solution is administered, the absorption of water with a subsequent transition to its elimination by the intestinal walls occurs; on testing of the hypertonic solution, less elimination of water into the intestinal lumen than normal is noted.

"6. A milk-egg diet had a normalizing effect on the dynamics of water absorption during a subacute course of radiation sickness.

"7. In the majority of cases, radiation injury was accompanied by a greater decrease in the intensity of the process of glucose and water absorption at the peak of digestion than on an empty stomach, while under normal conditions the reverse was observed."

123. Decreased Bromosulfalein Excretion After Irradiation

"The Excretion of Bromosulfalein by Mice After X-Ray Irradiation of the Upper Part of the Body," by M. Skalka, Institute of Biophysics of the Czechoslovak Academy of Sciences, Brno; Moscow, Meditsinskaya Radiologiya, Vol 4, No 3, Mar 59, pp 25-26

Liver function studies on bromosulfalein excretion were conducted on 150 mice for about 2 weeks after the X-ray irradiation of the upper parts of their bodies (head, greater portion of the chest, and the upper extremities) by 1,000, 2,000, and 4,000 r. Results, presented in graphs, show that after irradiation by 1,000 r (80% survival), there was a great difference in the elimination of bromosulfalein as compared with the normal amount. However, after irradiation by 2,000 r (almost an absolute lethal dose) and by 4,000 r (above the minimum absolute lethal dose), a rise in bromosulfalein retention was noted; sharp disturbances in bromosulfalein elimination began to appear starting with the tenth day after irradiation.

Histological studies revealed that in the majority of cases the extent of liver injury (fatty infiltration) corresponded in general, to the extent of disturbances in bromosulfalein elimination.

The author concludes that liver injuries, which are manifested by an increase in the bromosulfalein content, occur without the direct irradiation of the liver and are caused by lesions in other parts of the body.

124. Therapeutic Use of Radioactive Phosphorus in Osteoplastic Surgery

"Concerning the Problem of the Therapeutic Use of Radioactive Phosphorus in Osteoplastic Surgery" (Experimental Research), by A. A. Kravchenko, Ukrainian Scientific Research Institute of Orthopedics and Traumatology; Moscow, Ortopediya, Travmatologiya i Protezirovaniya, No 6, Jun 59, pp 79-83

The purpose of this reasearch was to develop a method of producing a local effect by radioactive phosphorus of various radiation intensities on the bone-forming elements in the stage of regeneration. A bone pin which was subjected to special treatment with P^{32} with the permanent source of radiant energy.

Analysis of the data obtained on 120 dogs and 149 rabbits shows that under the effect of the local use of radioactive phosphorus the process of bone growth and regeneration proceeds more rapidly and is completed in a shorter period than in a control group of animals.

It should be noted that the basic condition for achieving the therapeutic effect is direct effect exerted on the young cells of bone tissue in the stage of regeneration by the radioactive phosphorus, the radiation intensity of which should not exceed 10,000 impulses per minute per kg of body weight. In cases of extra-osseous location of the constant source of ionizing radiation, the therapeutic effect can be attained when the radiation intensity ranges from 15,000 to 25,000 impulses per minute per kg of body weight.

Veterinary Medicine

125. Outbreak of Foot-and-Mouth Disease

"Characteristics of the Course of a Foot-and-Mouth Disease Epizootic in Altayskiy Kray, From 1949 to 1952 and 1955 and 1956," by S. G. Poplaukhin, Sb. Nauchn. Rabot Altayski Krayevoy N.-I. Vet. Ct. (Collection of Scientific Works of Altayskiy Kray Scientific Research Veterinary Station), No 1, 1957, pp 112-118 (from Referativnyy Zhurnal -- Geografiya, No 5, May 59, Abstract No 14250)

"Intensive outbreaks of a foot-and-mouth disease epizootic during the winter were observed in Altayskiy Kray from 1949 to 1952 and in 1955 and 1956. The conditions under which foot-and-mouth disease was distributed and the dynamics of the epizootic in three rural and climatic zones [sic] of Altay were studied. It was established that an increase in the number of points threatened with the disease in the first, second, and fourth climatic zones corresponded to a decrease in the temperature of the air: this phenomenon was not observed in the third climatic zone."

126. Foot-and-Mouth Disease Virus Studied

"Certain Data on a Study of the Nature of Foot-and-Mouth Disease Virus," by V. I. Kindyakov, Tr. Kazakhsk, N.-I. Vet. In-ta (Works of the Kazakh Scientific Research Veterinary Institute), No 9, 1957, pp 23-32 (from Referativnyy Zhurnal -- Geografiya, No 5, May 59, Abstract No 14251)

"The results of a study of 174 strains of the virus of foot-and-mouth disease (Ya) which were obtained from cattle, swine, sheep, and bisons in foci of infection in the Central Asiatic republics and in Siberia are presented. The antigenic characteristics of the various strains of the virus of foot-and-mouth disease and their variants are examined, and two epizootic curves (by months) for Kazakhstan in 1955 and a table of distribution of types of the disease virus variants in different oblasts from 1937 to 1956 are presented."

127. Foot-and-Mouth Virus in Tissue Culture

"Replication Dynamics of the Foot-and-Mouth Disease Virus in Single-Layer Cultures and Suspensions of Trypsinized Calf Kidney Tissue," by V. A. Sergeyev and M. I. Yashenkina, All-Union Scientific Research Institute of Experimental Veterinary Medicine; Moscow, Doklady Vsesoyuznoy Ordena Lenina Akademii Sel'skokhozyaystvennykh Nauk imeni V. I. Lenin a, Vol 24, No 4, 1959, pp 16-18

In addition to the subject mentioned in the title, the possibility of obtaining two "harvests" of foot-and-mouth virus in a one-layer culture was investigated in the research reported in this article. Preparation of the cultures is described; the experiments were performed with a hog strain of type A foot-and-mouth virus adapted to a one-layer culture of calf kidney tissue. The strain had pronounced cytopathogenic action. Virus doses used to infect one-layer cultures and suspensions were 100 and 1,000 ID/50 per ml, respectively.

The virus titration procedures are discussed in detail. Virus replication under all experimental conditions investigated is shown by three graphs.

The data obtained in the experiments showed that the level of virus replication in suspensions was much lower than in one-layer cultures despite the higher concentration of cells in suspensions. Alternative explanations for this phenomenon are offered. Experiments with washed cultures showed that the virus continues to replicate after the maximum titer has been attained, but that the over-all titer does not increase further because of the increased rate of destruction. The author states in conclusion that the second "harvest" of foot-and-mouth virus obtained in one-layer cultures apparently has no practical significance because of its low titer.

128. Biomycin Preparations for Stock Breeding

"Economical Biomycin Preparations for Stock Breeding," by Prof A. Kh. Sarkisov, All-Union Institute of Experimental Veterinary Science; Moscow, Vestnik Sel'skokhozyaystvennoy Nauki, Vol IV, No 7, Jul 59, pp 73-80

To overcome the high cost of biomycin, an antibiotic widely used on stock-breeding farms and in veterinary therapeutic establishments, the collective of the Antibiotic Laboratory of the All-Union Institute of Experimental Veterinary Science and the research workers of the Moscow Chemicopharmaceutical Plant imeni Karpov developed two biomycin preparations: biovetin and biovit-40. Biovetin, a combination of the letters

bio from biomycin and vetin from veterinary, is an intermediate product obtained in the production of pure biomycin and has been found to be an effective prophylactic and therapeutic agent in diseases affecting growing stock. Biovit-40 (a combination of the letters bio from biomycin and vit from vitamin B_{12}) is obtained in the process of the deep fermentation by biomycin producers and is combined with vitamin B_{12}. It is effective in the prophylaxis and therapy of gastroenteric and pulmonary diseases of growing hogs and poultry and contributes to their growth and gain in weight. Both preparations are inexpensive, the cost of biovetin being 564 rubles per kilogram. Further studies of the preparations for possible negative results on the organism must be conducted before they can be widely applied.

Virology

129. Virus-Induced Inflammation of the Cerebrum

"New Data in the Investigation of Virus-Induced Inflammation of the Cerebrum and its Membrane," by M. Gresikova, Nasa Veda (Czechoslovakia), 1958, 5, 7-8 (from Meditsinskiy Referativnyy Zhurnal, Section 1, Vol 111, No 7, Jul 59, p 119)

"Investigations based on Pavlov's studies of natural foci of diseases were conducted. In experiments conducted on goats infected subcutaneously with the tick-borne encephalitis virus, a systematic study of viremia and secretion of the virus in milk was carried out. The virus appeared later and was retained for a longer period of time in the milk than in the blood. Four days after the infection (inoculation), a 50 million LD_{50} of the virus was found in one liter of milk. The tick-borne encephalitis virus was isolated also from the blood and milk of sheep. The virus titer in the milk of sheep was considerably higher than that found in the blood. Virus secretion in the milk was found also in sheep infected directly by the ticks. Experimental studies on the course of the infection in cows infected with the tick-borne encephalitis virus were carried out. The cows exhibited no symptoms of the disease even in cases when the virus was isolated from their milk and blood. The virus of tick-borne encephalitis is well preserved in dairy products: sour cream, butter, sour milk, cottage cheese. The virus is preserved best and for longer periods of time in butter, where it remains for periods of 2 months without losing its virulence."

130. Chinese Study Nonspecific Stimulation of Mice With Influenza

"The Effect of Hypotonic Saline Stimulation on the Replication of Influenza Virus in and its Adaptation to Mouse Lung," by Liu Yuan-yuan (柳元元), Tai Ying (戴瑩), and Huang Chen-hsiang (黃鎮祥), Department of Virology, Chinese Academy of Medical Sciences; Peiping, Jen-min Pao-chien (People's Health), Vol 1, No 8, Aug 59, pp 735-737

This item presents the details of animal experiments undertaken to investigate (1) whether nonspecific stimulation facilitates the adaptation of influenza virus to the lungs of white mice, and (2) whether the enhanced concentration of influenza virus in the lungs caused by nonspecific stimulation of experimentally infected mice can induce a higher serum specific antibody titer. The authors used sterile hypotonic saline solution containing 0.425% NaCl as the nonspecific stimulant. It was administered intranasally to mice in the experimental groups. Animals in the control groups received none.

It was found that such hypotonic saline stimulation hastened the adaptation of the FM_1 strain of influenza virus to the lungs of mice. This was demonstrated by the fact that in serial passage in mice, the virus killed all the animals in the stimulated group during the sixth passage, whereas the mice in the control group survived up to the 12th passage.

It was also found that hypotonic saline stimulation could bring death to experimental mice which received nonlethal doses (1/10 and 1/100 LD_{50}) of the virus, and also could raise their hemagglutination-inhibiting antibody titer.

The role of nonspecific stimulation in the spread of influenza is discussed.

The authors state that the successful adaptation of influenza virus to the mouse lung has practical application in the study of the effect of antibiotics, pharmaceuticals, and aerosols on the virus, as well as in the study of its antigenicity. Whether nonspecific stimulation has the same effect on other animals as on mice merits investigation, they say.

131. Conference on Virology

"Scientific Session on Problem Areas of General Virology," by Yu. Borisovich; Moscow, Vestnik Sel'skokhozyaystvennoy Nauki, Vol 4, No 7, Jul 59, pp 146-147

The 12th Scientific Session of the Institute of Virology imeni D. I. Ivanovskiy, devoted to the problems of general virology, was held 1-4 April 1959. About 450 scientists participated, including more than 60 who represented agricultural scientific research institutions (All-Union Institute of Veterinary Virology and Microbiology [Vsesoyuznyy Institut Veterinarnoy Virusologii i Mikrobiologii] State Scientific Control Institute for Veterinary Preparations, All-Union Institute of Experimental Veterinary Medicine, etc.). Among the subjects on the agenda were: current problems in general virology; the nature of viruses (morphology, physiology, biochemistry); pathogenesis and antiviral immunity; the diagnosis of virus diseases; training cadres of virologists and problems connected with the further development of virology in accordance with resolutions of the 21st Congress of the CPSU.

The following scientists gave reports or discussions: V. L. Ryzhkov, V. M. Zhdanov, M. I. Gol'din, K. A. Vanag, L. P. Gorshunova, V. V. Florinskiy, L. A. Zil'ber, I. M. Kryukov, A. D. Ado, A. Kh. Kanchurin, R. M. Shen, A. K. Shubladze, V. A. Anan'yev, O. G. Andzhaparidze, V. D. Solov'yev O. P. Peterson, A. G. Panov, P. I. Remezov, A. T. Kravchenko, A. I. Protsenko, I. L. Bogdanov, P. N. Kosyakov, and V. D. Timakov.

Timakov's discussion concerned the use of equipment, the most effective assignment of scientific workers for the solution of current virological problems, an increase in the theoretical level of scientific workers, and the eradication of a number of viral diseases.

A number of resolutions which concerned the control and eradication of diseases, means of decreasing disease incidence, and ways to improve the quality of scientific research were adopted at the session. The expediency of carrying out combined research with the All-Union Institute of Veterinary Virology and Microbiology was emphasized.

132. Properties of Boron Carbide-Molybdenum Disilicide Alloys

"Alloys of the Boron Carbide-Molybdenum Disilicide System," by G. V. Samsonov, V. S. Sinel'nikova, and P. S. Kislyy, Institute of Powder Metallurgy, Cermets, and Special Alloys, Academy of Sciences Ukrainian SSR; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 8, Aug 59, pp 866-868

Properties of the boron carbide-molybdenum disilicide alloys were investigated by the methods of metallography, X-ray diffraction, electrical conductivity, and thermal EMF measurements. It was established that there is formation of a Nowotny type quaternary phase Mo (Si, B, C) with a variable composition and an extensive region of homogeneity, within which (from 10 to 50 mol % of $MoSi_2$ in alloys with B_4C) the resistivity increases and the thermal EMF decreases in dependence on the number of defects in the lattice of this phase. It was found that the quaternary compound is highly resistant to oxidation.

133. Constitutional Diagram of Chromium-Rhenium Alloys

"The Constitutional Diagram of the Chromium-Rhenium System," by Ye. M. Savitskiy, M. A. Tylkina, and K. B. Povarova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 8, Aug 59, pp 1928-1930

By using data obtained in physico-chemical analysis (melting point determinations, microscopic examination, X-ray diffraction analysis, and measurements of hardness and microhardness), a constitutional diagram of the system chromium-rhenium was constructed.

134. σ-Phases in Re-Mn and Re-Fe Alloys

"Formation of σ-Phases in the Systems Rhenium-Manganese and Rhenium-Iron" by Ch. V. Kopetskiy; V. Sh. Shekhtman; N. V. Ageyev, Corresponding Member, Academy of Sciences USSR; and Ye. M. Savitskiy, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 1, 1 Mar 59, pp 87-88

Formation of σ-phases in rhenium-manganese and rhenium-iron alloys was investigated. The theoretical aspects of the results obtained are discussed, particularly so far as formation of an σ-phase in rhenium-manganese alloys is concerned. The importance of an investigation of metals of the VIIA subgroup is pointed out. Both rhenium and manganese, which belong to this subgroup, are considered to exhibit anomalous behavior.

135. Application of Solvent Extraction in Cobalt-Nickel Metallurgy

"Application of Organic Solvents in the Metallurgy of Nickel and Cobalt," by L. G. Moskalenko; Moscow, Tsvetnyye Metally, Vol 32, No 7, Jul 59, pp 40-46

The great difference in the behavior of nickel salts towards some organic solvents, as compared to that of cobalt salts (and also of those of iron and copper) can be utilized for the separation of nickel from cobalt (and also from iron and copper). As selective solvents for this purpose, esters saturated with hydrogen chloride proved to be best: nickel salts are completely insoluble in them.

136. Electric Welding in a Water Vapor Medium

"Welding in a Medium of Water Vapor" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 4 Sep 59, p 1

Usual manual arc welding methods employing protective gas media for correcting casting defects are being widely substituted by semiautomatic and automatic methods employing water vapor as a protective medium. Tests indicated that the large quantity of moisture prevented weld joint porosity and improved weld quality. No special welding wires are required.

The original welding machine was designed and developed at the Stalinskiy Plant imeni the 15th Anniversary of the Lenin's Young Communist League of the Ukraine. No specifications are given.

137. Giant Rolling Mill Shop Rises in Lipetsk

"The Largest in the World" (unsigned TASS article); Moscow, Sovetskaya Aviatsiya, 9 Sep 59, p 1

A giant rolling mill shop, said to be the largest in the world, is under construction at the Novolipetsk Metallurgical Plant for cold rolling electrical steels. Assembly of a 3,400-ton, five-stand tandem mill and other new types of equipment is in progress within the 120,000-sq m shop area. All production processes will be completely mechanized and automatic down to stacking, packing, and discharge of sheets from the mill. Steel in thicknesses down to 0.1 mm will be rolled at a speed of 35 m/sec, which is said to be several times faster than at the most advanced plants in the US.

138. Heavy Machine Building Institute for Sverdlovsk in 1960

"Plant Institute" (unsigned article); Moscow, Izvestiya, 4 Sep 59, p 3

The Scientific-Research Design-Technological Institute of Heavy Machine Building is being organized at the Ural Heavy Machine Building Plant (Uralmash) in Sverdlovsk. Founded on design and technological branches and the Central Laboratory of Uralmash, the new institute will conduct scientific research and experimental work in the development of advanced forms of equipment and technological processes.

The institute will be composed of general engineering and specialized laboratories and five design bureaus: rolling equipment, heavy hydraulic presses and blast furnace equipment, drilling equipment, mine machine building and electric drives, and automation. An experimental shop will be alloted to the institute for developing and testing new machines and production technologies. The director and chief engineer of Uralmash will head the institute.

Uralmash is presently receiving funds for construction of an institute building and necessary facilities and for acquisition of various types of equipment. Completion of the institute is expected in 1960.

Mechanics

139. Effect of Electromagnetic Field on Detonations

"Effect on an Electromagnetic Field on a Detonation System," by G. A. Lyubimov, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 3, 21 May 59, pp 532-533

The propagation of a detonation wave through a gas in an electromagnatic field is studied. It is noted that the fact that the gas becomes conducting after the passage of the detonation wave must be taken into account. Examples are given which show that a detonation system can be influenced by an electromagnetic field since the systems obtained under certain conditions are inadmissable in the absence of a field.

140. Bending of Plate Supported by System of Springs Studied

"Bending of a Semi-Infinite Plate on a Combined Elastic Support," by G. Ya. Popov; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 3, 21 May 59, pp 534-537

An exact solution is given to the problem of the bending of a semi-infinite plate on an elastic support. This support is an elastic half-space which is covered with a system of individual springs of stiffness k. The problem of the bending of a semi-infinite plate on an elastic half-space is considered as a particular case of the problem (k=0).

141. Exact Solutions Given for Magnetohydrodynamics Equations

"Exact Solutions of the Equations of Motion of Magnetohydrodynamics Limited to Automodeling," by N. N. Kochina, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 3, 21 May 59, pp 528-531

Certain exact solutions of the equations for the one-dimensional nonstationary motion of an ideal conducting gas are found for the magnetohydrodynamics case. The motions are limited to automodeling motions.

142. Squeezing of Conducting Flow Around Magnetized Body

"On the Phenomenon of the Magnetic 'Squeezing' of the Flow of a Conducting Medium," by V. N. Zhigulev, Central Aerohydrodynamics Institute imeni N. Ye. Zhukovskiy; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 3, 21 May 59, pp 521-523

The flow of a conducting medium around a body which possesses a magnetic field, such as that produced by an electric current flowing in the body, is considered. The two-dimensional case of problems involving the phenomenon of the "squeezing" of the flow of the conducting medium at high magnetic Reynolds numbers is set up. The example taken is that of the hypersonic flow of a gas around a linear current. A method of solution is given.

143. Degree of Equations for Shock Waves Reduced

"On Computing Shock Waves in Magnetohydrodynamics," by M. I. Kiselev, Moscow State Universtiy imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 3, 21 May 59, pp 524-527

Computing difficulties were met in solving for the parameters of magnetohydrodynamic shock waves in an ideal gas with isentropic $p = A^k$. It turned out that the calculations led to algebraic equations of the third degree and higher. It is shown that the computations may always be simplified by lowering the degree of the equations to unity.

144. Subsonic Flow Around Ellipse Computed

"Subsonic Flow With Circulation Around Ellipses," by P. I. Chushkin, Computing Center, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 4, 1 Apr 59, pp 748-751

A numerical method is described for computing the subsonic circulation flow of a gas around an ellipse. The results for a particular problem computed on the BESM computer are given.

145. Transition From Turbulent to Laminar Boundary Layer Studied

"Transition From a Turbulent to a Laminar Boundary Layer," by A. A. Sergiyenko and V. K. Gretsov; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 4, 1 Apr 59, pp 746-747

The transition of a turbulent boundary layer into a laminar boundary layer for a large negative pressure gradient in a supersonic jet was studied. The velocity of the basic flow in the jet increased continuously from 45 to 360 m/sec. In the experiment, air from a reservoir was directed along a symmetric tube 76 mm in diameter and 1000 mm in length. Behind the tube was placed an axially symmetric supersonic jet with a critical cross section of 36 mm and a Mach number of 2.6 at the exit.

The boundary layer was studied at the end of the cylindrical tube or, in other words, directly in front of the jet and at the exit of the jet. The velocity profile in the boundary layer was measured, and the effect of large negative velocity gradients on the turbulent boundary layer which develops on the walls of the tube was investigated.

Nuclear Physics

146. Start-Up of Experimental Reactor in Uzbek SSR

"Scientific City of the Peaceful Atom," by A. Ivakhnenko; Moscow, Pravda, 11 Sep 59, p 6

The start-up of an experimental reactor at the Institute of Nuclear Physics, Academy of Sciences Uzbek SSR, occurred on 10 September 1959.

147. Scintillator Consisting of Fibers

"A Fiber Scintillator for Luminescence Chambers," by O. V. Savchenko, Joint Institute of Nuclear Research; Moscow, Pribory i Tekhnika Eksperimenta, Jul/Aug 59, pp 142-143

In luminescence chambers of the type being applied at present (cf Ye. K. Zavoyskiy, M. M. Butslov, A. G. Plakhov, and G. Ye. Smolkin, Atomnaya Energiya, 4, 1956, p 34), only about 0.1% of the total light radiation emitted by an inorganic phosphor as a result of the passage of an ionizing particle is transmitted to the photocathode of the amplifier. Organic scintillators, which are of particular interest for applications in work with accelerators, cannot be used at all in luminescence chambers of this type because the amount of light reaching the

photocathode drops below the sensitivity threshold of the photoelectric converter. O. V. Savchenko proposed that the fraction of light received by the amplifier be augmented by using a scintillator which consists of a bundle of fibers (cf V. I. Nikanorov, A. F. Pisarev, and O. V. Savchenko, Otchet Laboratorii Yadernykh Problem OIYaI [Report of the Laboratory of Nuclear Problems, Joint Institute of Nuclear Research] May 1957).

In a chamber designed on this principle, the ends of the parallel fibers abut directly on the amplifier. Because there is complete reflection of light within the fibers, the total quantity of light reaching the amplifier is greater when this arrangement is used. Only those fibers scintillate through which ionizing particles pass, and so the path of particles projected onto a plane parallel to the photocathode can be recorded with a considerable degree of precision. If alternating layers of fibers which are perpendicular to each other are used, the path of a particle can be recorded tridimensionally (i.e., projections of the path on three mutually perpendicular planes are obtained).

Testing of plastic fibers consisting of polystyrene or polyvinyltoluene to which different luminescent components had been added showed that the greatest length of path (10-15 cm) of emitted light necessary for optical absorption of the scintillator's own spectrum is obtained when polystyrene containing 1% tetraphenylbutadiene is used. A fiber surface that is best from the optical standpoint results when the fibers are polymerized rapidly and the total duration of the process of their production is kept within approximately 28 hours. The fibers (one mm in diameter or finer) are extruded from a melt that is protected from contact with the air.

A device of the same type as that designed by the author was described by G. T. Reynolds and P. E. Condon in Review of Scientific Instruments, Vol 28, 1957, p 1098. However, no data on the production of plastic scintillator fibers or the optical characteristics of scintillators assembled from such fibers were given.

148. New Method for Finding Thermodynamic Potentials

"New Method in Classical Statistical Physics," by A. A. Vedenov, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 4, 1 Apr 59, pp 757-760

A new method for finding the thermodynamic potentials of a system of interacting particles in classical statistical physics is presented. The method is said to avoid certain unsatisfactory features of the method of correlation functions. Both long- and short-range interactions are considered.

149. A "Quenching" Function

"Introduction of a 'Quenching' Function Into Dispersion Relations," by V. A. Fok, Academician, and F. M. Kuni; Moscow, Doklady Akademii Nauk SSSR, Vol 127, No 6, 21 Aug 59, pp 1195-1198

The attempt is made to derive an extension of the dispersion amplitude of energy, its behavior in the "physical" region being specified, into the upper "nonphysical" semiplane.

150. Field of Photoelectrets

"The Field Role in the Formation of a Heterodischarge of a Photoelectret," by B. M. Golovin, N. T. Kashukeyev, and V. M. Fridkin, Institute of Crystallography, Academy of Sciences USSR; Physics Institute, Bulgarian Academy of Sciences; Joint Institute of Nuclear Research; Moscow Doklady Akademii Nauk SSSR, Vol 128, No 1, 1 Sep 59, pp 63-66

An attempt is made to introduce the field notion in the equations of photoelectret state of a monocrystal by analyzing previously derived equations by V. M. Fridkin (DAN, 121, No 4, 627, 1958). A system of nonlinear equations is obtained, expressing variations in time of electron concentration n in the conducting zone and N on the adherence levels and of hole concentration P in the basic zone during illumination of a crystal in the applied field.

151. Ionic Optical Systems

"A Method for an Approximate Calculation of Ionic Optical Systems With Allowance for the Space Charge, Based on Modeling in a Three-Dimensional Electrolytic Bath," by V. M. Breytman; Moscow, Doklady Akademii Nauk SSSR, Vol 127, No 6, 21 Aug 59, pp 1187-1190

Because of insurmountable difficulties in solving equations of electron motion in an electrostatic field, some simplifications are suggested by means of modeling in a three-dimensional electrolytic bath containing a specially computed relief "bottom" and boundary electrodes corresponding to an emitter and collector.

Miscellaneous

152. Expansion of Physics Research in Georgian SSR

"Problems of Contemporary Physics," by A. N. Dronikashvili, Academician, Academy of Sciences Georgian SSR; Tbilisi, Zarya Vostoka, 13 Jun 59

"What are the problems that are being studied and will be studied in the near future by the physics institutions working in the territories of the Georgian SSR, including the Physics and the Physicotechnical Institutes of the Academy of Sciences Georgian SSR, the Tbilisi State University imeni Stalin, the Sukhumi Scientific Naval Station of the Acoustics Institute, Academy of Sciences, and others?

"Few people are aware of the tempo of the development of physics in the Georgian SSR. The work on thermonuclear reactions which is being done there was discussed in a report given by I. V. Kurchatov at the 21st Congress of the CPSU. Likewise, considerable success has been accomplished in the field of semiconductors. In the past few years, work on semiconductors, especially physics of semiconductors, has been greatly accelerated, as, for example, at the Institute of Physics and Tbilisi State Universtiy. It is estimated that, soon, within the system of the Academy of Sciences Georgian SSR, a special Institute of Semiconductors (Institut Poluprovodnikov) will be established on the basis of several divisions now operating in various scientific institutions.

"A number of young Georgian scholars who are currently working on the study of cosmic rays and high energy particles have formulated a new school of thought on this subject. Of considerable importance in the

work of these scholars has been the research done at the El'brusk Mountain Station of the Institute of Physics, Academy of Sciences Georgian SSR, and the Tbilisi State Universtiy. Soon these scholars will also have at their disposal a new mountain station at the Tskhra-Tskaro Pass, which will have a powerful and unusual electro-magnet.

"Participating in the scientific work of the Joint Institute of Nuclear Research, the Institute of Physics, Academy of Sciences Georgian SSR, at the beginning of the Seven-Year Plan, will considerably expand its work in the study of the properties of "elementary" particles and "anti-particles."

"In the process of expanding research on physics, the Tbilisi State University has established a number of laboratories which are conducting work on physics: The Laboratory of the Physics of Low Temperatures and the Cryogenic Laboratory. Both of these laboratories are conducting experiments in quantum liquids and surface conductivity in low temperatures and its application in computer engineering."

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